9-1000-213-35

TM 9-1000-213-35

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

Direct Support, General Support, and Depot Maintenance Manual
for
CANNON, 105-MM GUN, M68,
MOUNT, COMBINATION GUN, M116 AND M140,
AND CUPOLA, TANK COMMANDER'S CALIBER .50
MACHINE GUN, M19 USED ON:
TANK, COMBAT, FULL-TRACKED: 105-MM GUN,
M60A1 W/E (2350-756-8497)
TANK, COMBAT, FULL-TRACKED: 105-MM GUN,
M60 W/E (2350-678-5773)

This copy is a reprint which includes current pages from Changes 1 through 11.

HEADQUARTERS, DEPARTMENT OF THE ARMY
APRIL 1966

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TM 9-1000-213-35
C 11

Change }
No. 11 }

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, DC, *8 July 1975*

Direct Support, General Support and Depot Maintenance Manual
CANNON, 105-MM GUN, M68
MOUNT, COMBINATION GUN, M116 AND M140
AND CUPOLA, TANK COMMANDER'S CALIBER .50
MACHINE GUN, M19 USED ON:
TANK, COMBAT, FULL-TRACKED: 105-MM GUN,
M60A1 W/E (2300-00-756-8497) AND
TANK, COMBAT, FULL-TRACKED: 105-MM GUN,
M60 W/E (2300-00-678-5773)

TM 9-2300-213-35, 21 April 1966, is changed as follows:

1. Remove old pages and insert new pages as indicated below. New or changed material is indicated by a vertical bar in the margin of the page. Added or revised illustrations are indicated by a vertical bar adjacent to the identification number. The general area of change in a revised illustration is indicated by a miniature pointing hand.

Remove pages	*Insert pages*
1-9/(1-10 blank)	1-9/(1-10 blank)
4-33 and 4-34	4-33 and 4-34
4-34.1(4-34.2 blank)	4-34.1 through 4-34.4
4-39 and 4-40	4-39 and 4-40

2. File this change sheet in front of the publication for reference purposes.

By Order of the Secretary of the Army:

FRED C. WEYAND
General, United States Army
Chief of Staff

Official:

VERNE L. BOWERS
Major General, United States Army
The Adjutant General

Distribution:
To be distributed in accordance with DA Form 12-37A (qty rqr block No. 659), Direct and General Support maintenance requirements for Tank, 105-MM, M60, M60A1.

*TM 9-1000-213-35
C 5

TECHNICAL MANUAL
NO. 9-1000-213-35

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., *21 April 1966*

DS, GS, and Depot Maintenance Manual

FOR

CANNON, 105-MM GUN, M68, MOUNT, COMBINATION GUN, M116 AND M140 AND CUPOLA, TANK COMMANDER'S CALIBER .50 MACHINE GUN, M19 USED ON:

TANK, COMBAT, FULL-TRACKED: 105-MM GUN, M60A1 W/E (2350-756-8497)

TANK, COMBAT, FULL-TRACKED: 105-MM GUN, M60 W/E (2350-678-5773)

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CHAPTER	2. REMOVAL/INSTALLATION OF ARMAMENT		
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CHAPTER	4. REPAIR OF MOUNTS M116 AND M140		
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	IV. Repair of recoil mechanism	4-8	4-33

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*This manual supersedes TM 9-1000-213-34, 5 February 1963, TM 9-1000-213-35P, 6 December 1962, SM 9-4-4933-E18, 7 August 1963, and so much of TB 9-1000-220-35, 3 April 1961, as pertains to M60 series.

		Paragraph	Page
CHAPTER	5. REPAIR OF CUPOLA M19	5-1	5-1
APPENDIX	A. REFERENCES	A-1	A-1
APPENDIX	B. Deleted		
INDEX			Index I

CHAPTER 1
INTRODUCTION

1-1. Scope

a. This manual contains instructions for direct support, general support and depot maintenance of 105-mm gun cannon M68, combination gun mounts M116 and M140, and commander's cupola M19 (fig. 1-1 through 1-4).

b. Other applicable publications and forms are listed in Appendix A. The maintenance allocation chart in TM 9-2350-215-20 allocates maintenance responsibilities.

c. The reporting of errors, omissions, and recommendations for improving this publication by the individual user is encouraged. Reports should be submitted on DA Form 2028, Recommended Changes to Publications, and forwarded direct to the Commander, US Army Armament Command, ATTN: AMSAR-MAS, Rock Island IL 61201.

1-2. Forms, Records, and Reports

a. Authorized Forms. TM 38-750.

b. Field Report of Accidents.

(1) *Injury to personnel or damage to materiel.* AR385-40.

(2) *Ammunition.* AR 75-1.

1-3. Description and Tabulated Data

Refer to TM 9-2350-215-10.

1-4. Parts, Tools, and Equipment

a. Maintenance Parts. Refer to TM 9-1000-213-35P.

b. Common Tools and Equipment. Pertinent TA's, TOE's, and supply catalogues.

c. Special Tools and Equipment. The special tools and equipment in table 0 are listed in and authorized for issue by TM 9-1000-213-35P as Tool Kit FSN 5180-690-3763. Cannon bore inspecting equipment is found in SC 6650-95-CL-E01 and SC 4933-95-CL-E09.

1-5. Improvised Tools

The tools in table 1 may be fabricated locally to facilitate major repair of a large quantity of weapons. They are not available for issue.

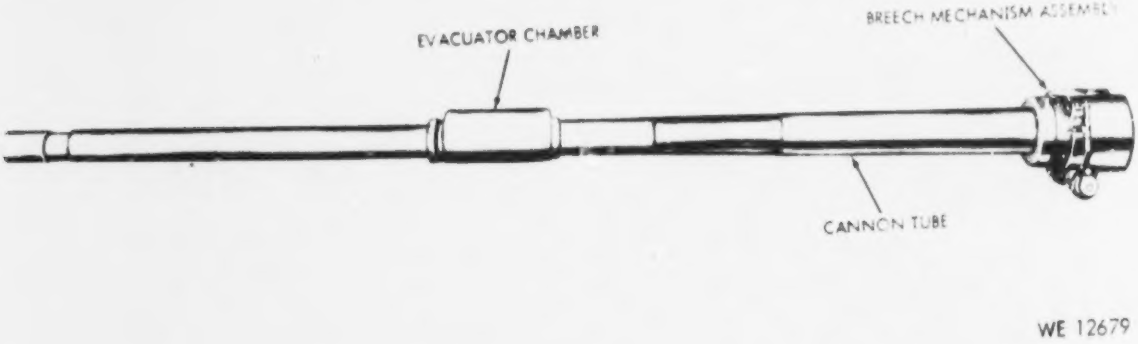


Figure 1-1. 105-mm gun cannon M68.

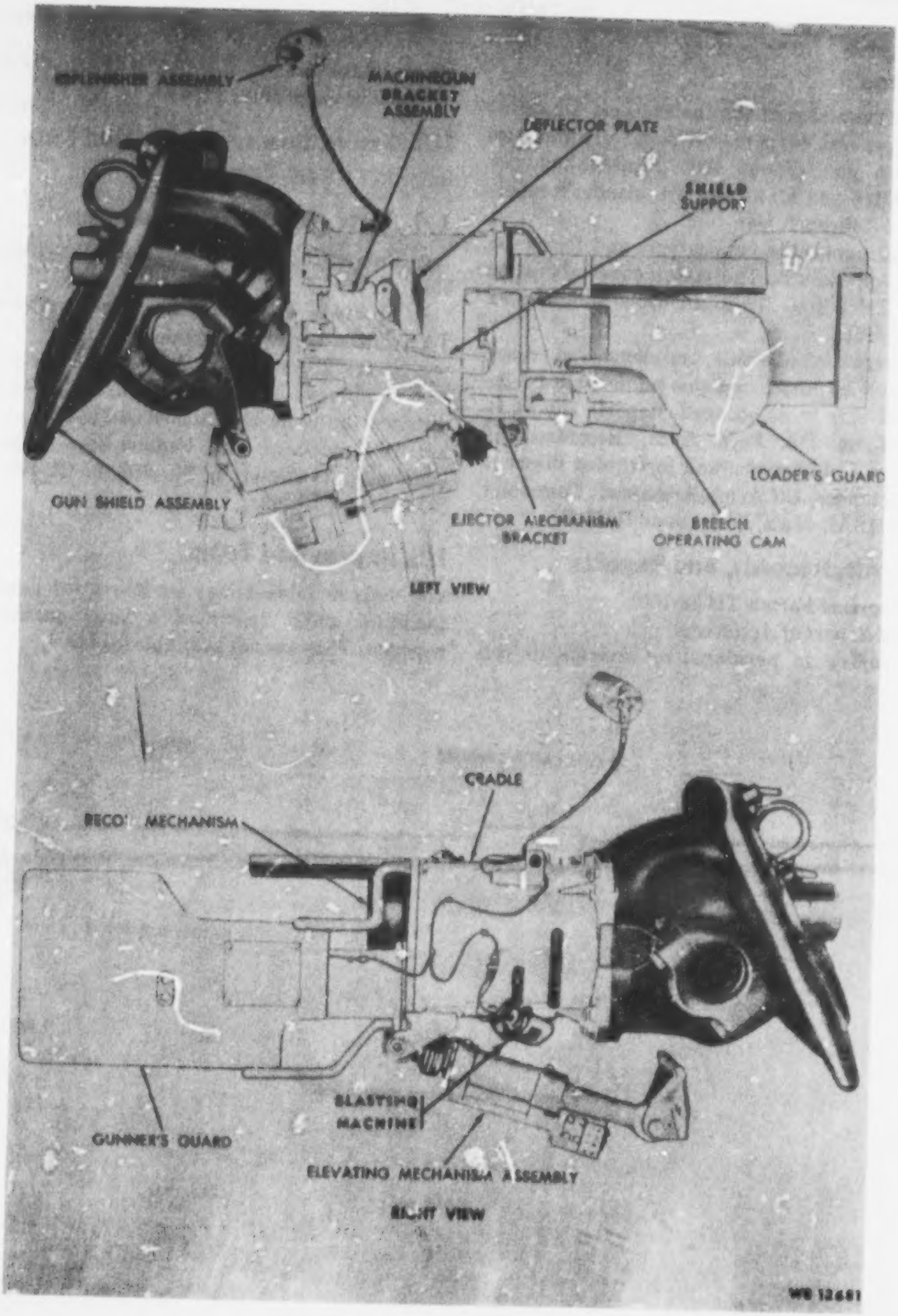

REPLENISHER ASSEMBLY
MACHINEGUN BRACKET ASSEMBLY
DEFLECTOR PLATE
SHIELD SUPPORT
LOADER'S GUARD
GUN SHIELD ASSEMBLY
EJECTOR MECHANISM BRACKET
BREECH OPERATING CAM
LEFT VIEW
CRADLE
RECOIL MECHANISM
GUNNER'S GUARD
BLASTING MACHINE
ELEVATING MECHANISM ASSEMBLY
RIGHT VIEW
WE 12681

Figure 1-2. Combination gun mount M116.

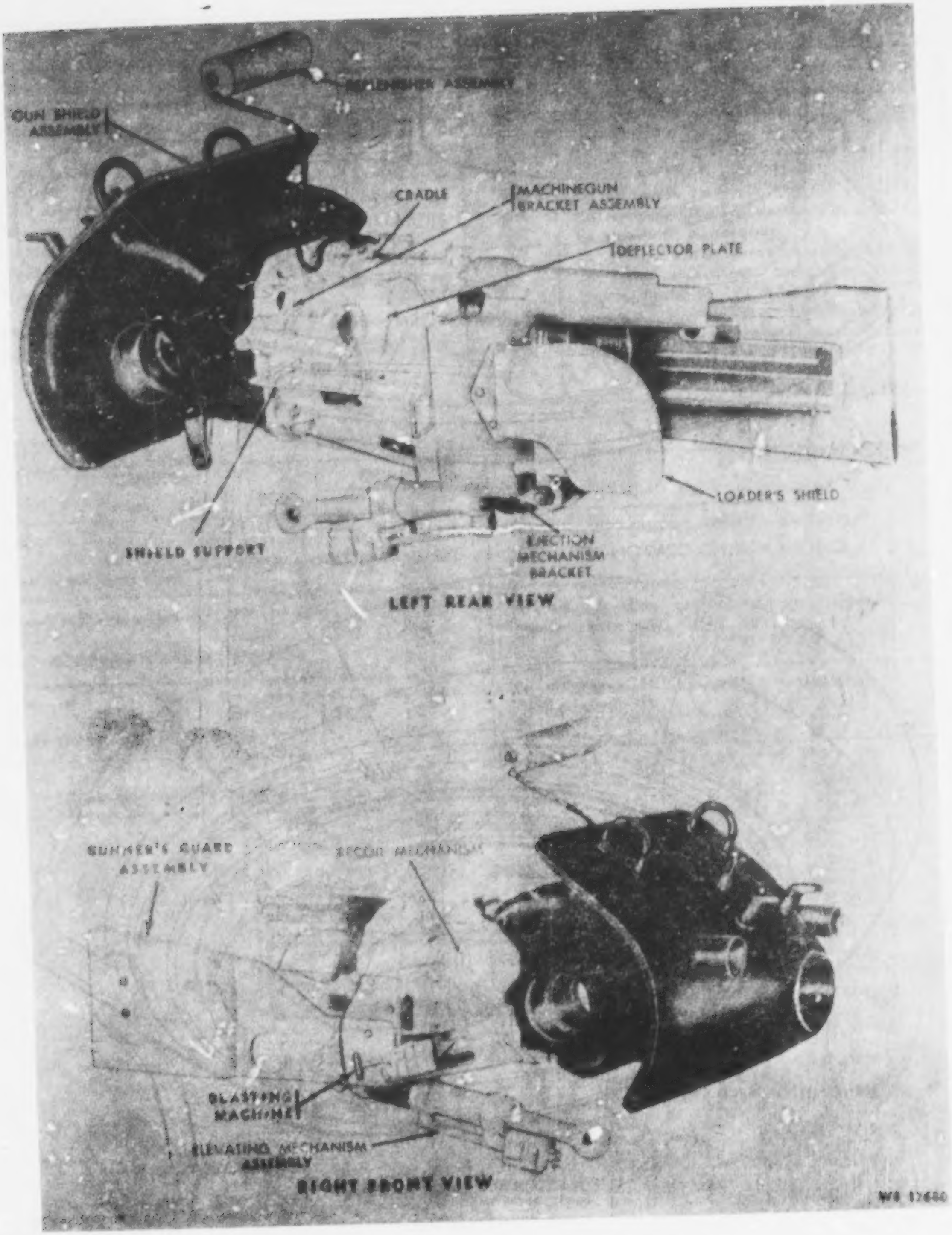

REPLENISHER ASSEMBLY
GUN SHIELD ASSEMBLY
CRADLE
MACHINEGUN BRACKET ASSEMBLY
DEFLECTOR PLATE
LOADER'S SHIELD
SHIELD SUPPORT
EJECTION MECHANISM BRACKET
LEFT REAR VIEW
GUNNER'S GUARD ASSEMBLY
RECOIL MECHANISM
BLASTING MACHINE
ELEVATING MECHANISM ASSEMBLY
RIGHT FRONT VIEW
WE 12680

Figure 1–3. Combination gun mount M140.

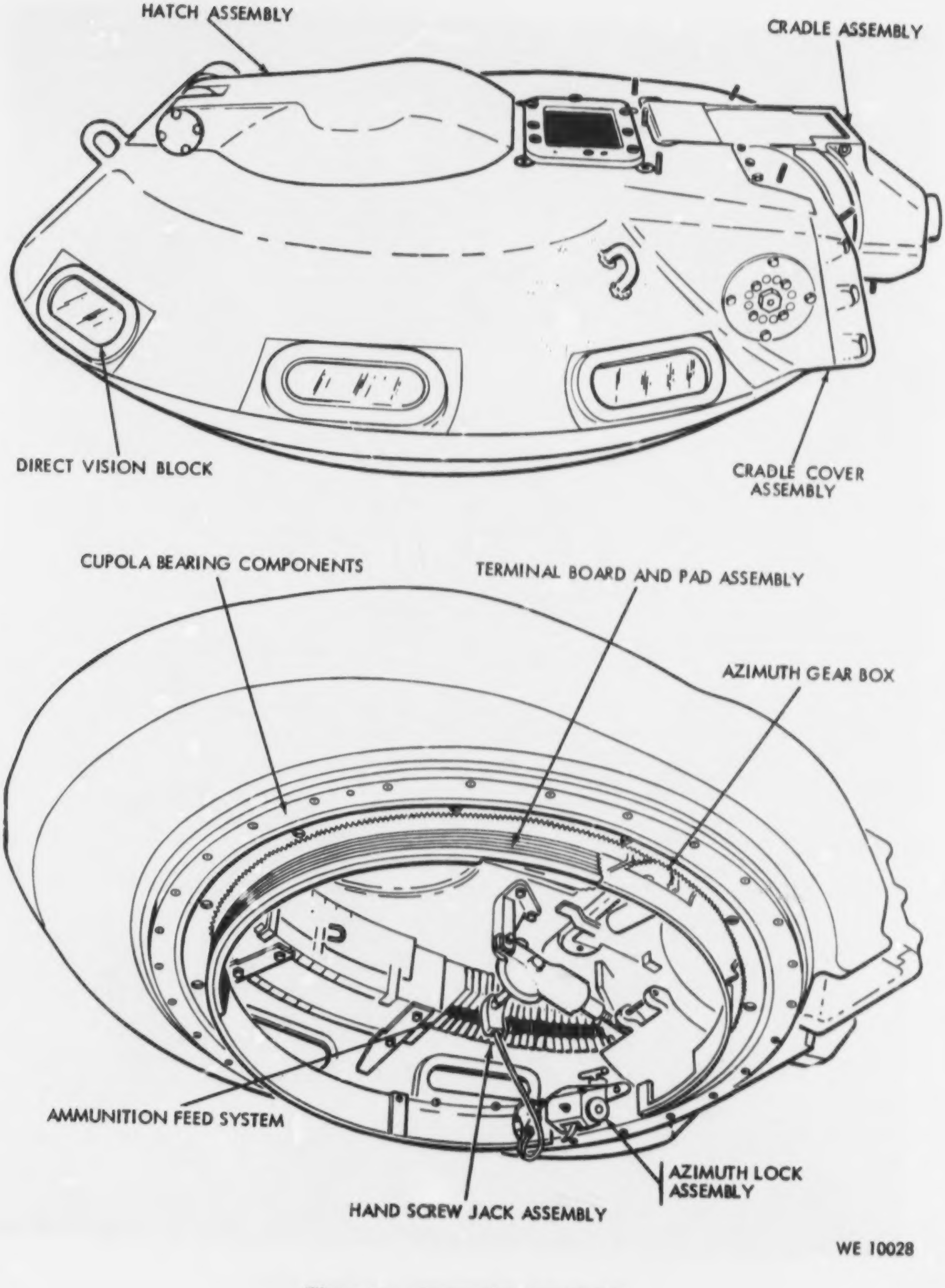

HATCH ASSEMBLY
CRADLE ASSEMBLY
DIRECT VISION BLOCK
CRADLE COVER ASSEMBLY
CUPOLA BEARING COMPONENTS
TERMINAL BOARD AND PAD ASSEMBLY
AZIMUTH GEAR BOX
AMMUNITION FEED SYSTEM
AZIMUTH LOCK ASSEMBLY
HAND SCREW JACK ASSEMBLY
WE 10028

Figure 1-4. Commander's cupola M19.

Table 0. Special Tools and Equipment

Item	FSN	Figure reference	Use
Clamp, puller and lifting	4933-039-5025	4-29	To remove piston assembly from recoil cylinder
Protector, assembling	4933-039-5028	4-30	To protect threads on recoil piston
Fixture assembly, spring compression	4933-393-0240	4-29	To remove / install spring from recoil mechanism
Wrench, tubular, collar firing plunger insert	4933-740-0447	....	To remove / install firing plunger insert collar (refer to TM 9-2350-215-20)
Tool assembly, breech lifting	4933-775-3742	3-4	To lift breech ring
Wrench, spanner	4933-775-3744	3-1	To remove / install evacuator chamber nut
Fixture, test, recoil mechanism	4933-830-5637	4-37	To test recoil mechanism
Wrench, spanner	4933-986-3129	3-3	To loosen / tighten breech adapter collar
Wrench, spanner	5120-293-0206	....	To adjust tension on breechblock closing spring (refer to TM 9-2350-215-10)
Pliers, retaining ring, external	5120-595-9552	4-32	To remove / install inertia valve retaining ring
Bolt, eye	5306-050-0348	2-5.2 2-6	To remove / install breechblock and gunner's guards (also refer to TM 9-2350-215-10)

Table 1. Improvised Tools

Item	References		Use	Fig *
	Fig	Para		
Centering plate Make from local stock	......	4-8.1	To center tube support sleeve for machining	1-7
Piston hold-down fixture Make from local stock	4-10, 4-11	4-2f	To test elevating mechanism (for depot maintenance only)	1-6
Push rod Make from 5/8-inch drill rod	4-16, 4-18	4-6a	To disassemble / assemble replenisher components	1-5

*Fabrication drawings in this manual.

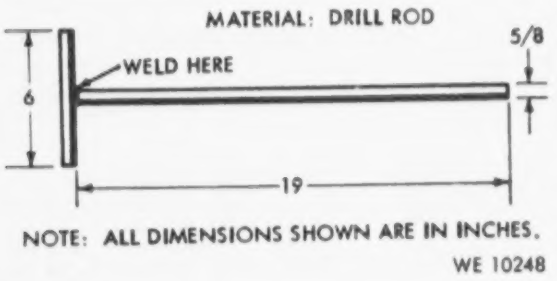
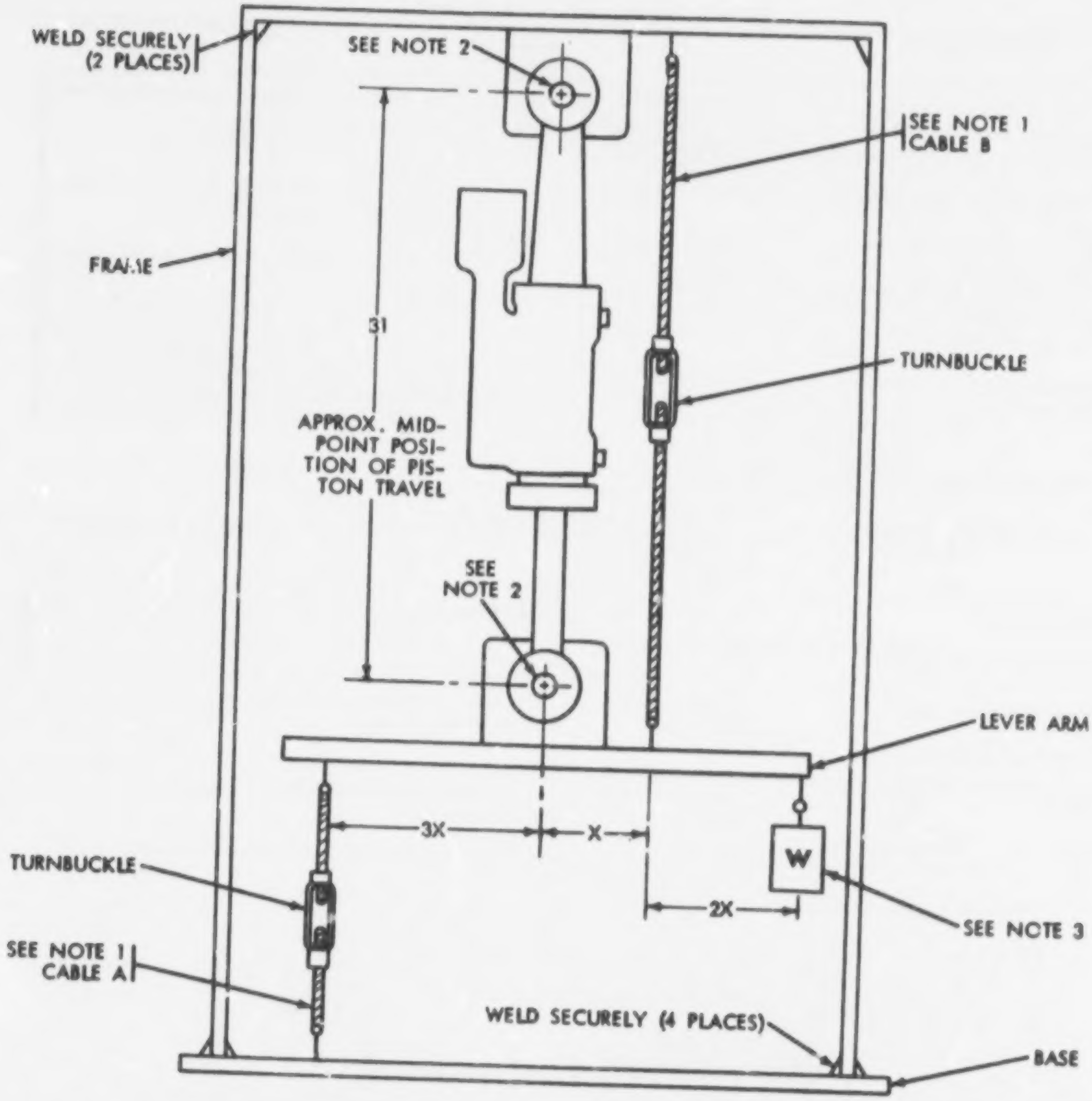


Figure 1-5. Fabricated tool for use in disassembly / assembly of replenisher components.


WELD SECURELY (2 PLACES)
SEE NOTE 2
SEE NOTE 1 CABLE B
FRAME
31
TURNBUCKLE
APPROX. MID-POINT POSITION OF PISTON TRAVEL
SEE NOTE 2
LEVER ARM
3X
X
W
TURNBUCKLE
2X
SEE NOTE 3
SEE NOTE 1 CABLE A
WELD SECURELY (4 PLACES)
BASE

NOTE: 1. BOTH CABLES MUST BE OF SUFFICIENT LENGTH TO ALLOW LEVER ARM TO REST IN THE HORIZONTAL PLANE PRIOR TO APPLYING LOAD.

2. USE SAME MOUNTING BOLTS AND NUTS THAT ARE USED TO MOUNT ELEVATING MECHANISM ASSEMBLY IN VEHICLE.

3. W = 200 LB. MINUS 1/2 WEIGHT OF LEVER ARM.

SUGGESTED DIMENSIONS
BASE: STEEL PLATE—4-1/2 FT. × 1-1/2 FT. × 1 IN.
CABLE STEEL—1/2 IN.
FRAME: I-BEAM—6 FT. × 4 FT.
LEVER ARM: STEEL—3 FT.-4 IN. × 2 IN. × 2 IN

WE 10249

Figure 1-6. Fabricated tool for use in testing elevating mechanism (for depot maintenance only).

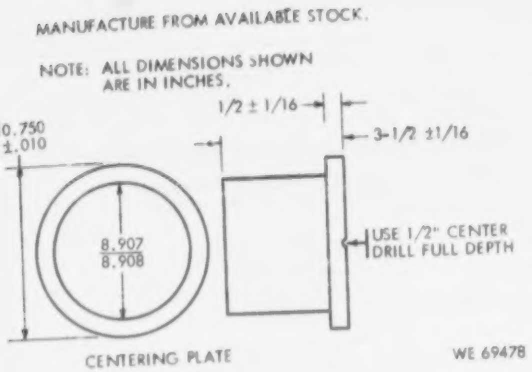

MANUFACTURE FROM AVAILABLE STOCK.
NOTE: ALL DIMENSIONS SHOWN ARE IN INCHES.
1/2 ± 1/16
3-1/2 ±1/16
10.750 ±.010
8.907 / 8.908
USE 1/2" CENTER DRILL FULL DEPTH
CENTERING PLATE
WE 69478

Figure 1-7. Fabricated tool for use in machining tube support sleeve.

1-6. Inspection of Materiel in Hands of Troops

Refer to AR 750-8 and preventive-maintenance tables in TM's 9-2350-215-10 and-20. The following additional standards pertain to preembarkation inspections.

a. Cannon Tube. Cannon tubes must have an estimated remaining tube life of at least 50 percent in order to be acceptable for oversea shipment.

b. Cupola Azimuth Gear Box Crank Arm. Backlash not to exceed 0.055-inch. Torque for left and right traverse not to exceed 30 inch-pounds during rotation from any position through 360 degrees azimuth. Arm measures three inches from center of drive shaft.

c. Cupola Screw Jack Arm. Backlash not to exceed 0.009-inch. Torque required to start elevation at any point not to exceed 30 inch-pounds (with machine gun installed). Arm measures 2½ inches from center of input shaft.

1-7. Maintenance Shop Inspection

a. Initial Inspection. Refer to table 2 of this manual and preventive-maintenance and troubleshooting tables in TM's 9-2350-215-10 and -20.

b. In-Process Inspection.

(1) See inspection tables in chapters 3, 4, and 5.

(2) All seals, packings, and gaskets will be replaced. Replace all tapered pins and cotter pins, if possible. Replace screws, bolts, nuts, and washers, if damaged.

(3) If economically feasible, damaged threads should be repaired by use of a thread restorer or by chasing on a lathe.

c. Final Inspection.

(1) All materiel shall be inspected after repair to make certain it meets the requirements provided herein and in the preventive-maintenance tables of TM 9-2350-215-10 and TM 9-2350-215-20 prior to acceptance for delivery.

(2) Compare identification markings on breech face and on top of breech ring body with those in Equipment Log Book (TM 38-750). They must correspond.

(3) Determine serviceability of cannon tube (TM 9-1000-202-35).

(4) Inspect muzzle end of tube for cracks in bore recess. Coat thread with graphite grease (GG). Coat bore lightly with medium lubricating oil.

(5) Inspect exterior of breech ring body for damage affecting proper functioning. Inspect interior for pressure cracks and damage. Look for burs and scores in breechblock slide area.

(6) Operate breech mechanism several times, observing smoothness of operation and effectiveness of closing action.

Table 2. Troubleshooting

NOTE

This tables does not list corrective actions which are authorized at organizational level. Before proceeding make certain that these have already been tried in attempt to correct malfunction.

Malfunction	Probable cause	Corrective action
	CANNON M68	
1. Failure to extract	*a.* Obstruction in chamber	*a.* Clean chamber
	b. Broken extractor	*b.* Replace extractor
	c. Deformed cartridge	*c.* Remove (TM 9-2350-215-10)
2. Ammunition fails to seat properly	*a.* Buildup of residue in chamber	*a.* Clean chamber
	b. Deformed cartridge	*b.* Dischard cartridge
	MOUNTS M116 AND M140	
3. Gun over recoils	*a.* Not enough oil in recoil mechanism	*a.* Replenish oil
	b. Defective recoil spring	*b.* Replace (para 4-8)
4. Gun does not return to battery	*a.* Defective recoil spring	*a.* Replace (para 4-8)
	b. Contacting surface of recoil cylinder assembly scored	*b.* Repair recoil cylinder (para 4-8)
	c. Defective piston assembly	*c.* Repair or replace piston assembly as necessary (para 4-8)
	d. Defective inertia valve	*d.* Repair or replace valve as necessary (para 4-8)
	e. Use of old configuration tube support sleeve 8762794 and recoil piston assembly 10915951	*e.* Machine sleeve and piston assembly (para 4-8.1)
5. Gun returns to battery with shock	*a.* Defective inertia valve	*a.* Repair or replace valve as necessary (para 4-8)
	b. Not enough oil in recoil mechanism	*b.* Replenish oil and check replenisher for leaks
6. Leakage	*a.* Worn or damaged recoil cylinder seals	*a.* Replace (para 4-8)
	b. Contacting surface of recoil cylinder scored, causing damage to seals	*b.* Repair recoil cylinder assembly and replace seals (para 4-8)
	c. Etching of piston or support sleeve static seal points of contact	*C.* Replace piston and/or sleeve as necessary (Para 4-8)
	ELEVATING MECHANISM	
7. Gun does not elevate or depress freely	Damaged relief or lock valves	Test and repair (para 4-2, 4-4*a*, and 4-5 *a*)
8. Superelevation not being applied	Superelevation actuator section of lock valve or relief valve defective	Repair or replace lock valve or relief valve (para 4-2. 4-4*a*, and 4-5*a*)
9. Gun shifts when operating over rough terrain	Relief valve assembly defective	Repair or replace (para 4-4*a*)
	CUPOLA M19	
10. Excessive backlash in azimuth gear	*a.* Excessive clearance between azimuth gear (in azimuth gear box assembly) and spur gear	*a.* Remove backlash (para 5-12*a*)
	b. Excessive backlash between gears in azimuth gear box assembly	*b.* Remove backlash (para 5-12*a*)
11. Excessive resistance in azimuth drive operation	*a.* Worn or deformed bearing balls in spur gear	*a.* Replace defective bearing balls (para 5-2)
	b. Excessive preload on spur gear bearing balls	*b.* Install shims as required (para 5-2)
	c. Broken or deformed teeth on spur gear	*c.* Replace gear (para 5-2)
	d. Broken or deformed teeth on azimuth gear box gears	*d.* Replace gear (para 5-2)
	e. Defective gear in azimuth gear box	*e.* Replace defective gear or gears (para 5-2 and 5-11)
12. Excessive backlash in cradle elevation drive	Broken or deformed teeth in screwjack	Replace screwjack assembly (para 5-6)

(7) Inspect recoil mechanism for fluid leakage at seal points.

(8) Inspect all hydraulic tubes, fittings, and components for leakage.

(9) Inspect mount cradle for cracks or malformations affecting serviceability or functioning.

(10) All repair parts and equipment must be complete.

(11) Lubrication must be complete in accordance with LO 9-2350-215-12.

(12) Paint must meet standards prescribed in TM 9-213.

(13) Inspect all nuts, bolts, screws, pins, and fastening devices for security of installation, damaged threads, and freedom from corrosion.

(14) Inspect all visible bushings and bearings for snug fit. Observe rotating parts in motion to determine that they operate smoothly and without excessive play.

(15) Cupola components must be intact and function effectively.

(16) Check cupola electrical wiring and fixtures for proper installation and electrical continuity.

(17) Insure that all cupola windows are clear and intact.

1.8. Special Maintenance for Cannon M68

If gun tube has not been removed or replaced for maintenance service within a period of one year (see REMARKS column of DA Form 2408-4, equipment log book), the following procedures will be performed:

a. Depress tube slightly below 0 mils and drain replenisher (TM 9-2350-215-10).

CAUTION

Block breech ring to support weight.

b. Disconnect replenisher from gun mount and install M3 oil pump in its place. Pump gun out of battery approximately 12 inches.

c. Remove breech lock and adapter collar from breech ring. (fig. 3-3).

d. Return piston halfway to battery position.

e. Inspect threads of adapter collar, breech ring, and abutting surfaces of recoil piston and breech ring for rust and corrosion. Clean thoroughly and lubricate lightly with GAA lubricant.

e.1. Remove key 7363895.

CAUTION

Do not remove adapter to perform check.

Check for diametrical movement of adapter 7363830 in relation to piston. Diametrical movement may not exceed 0.018 inch. Replace defective component if excess movement is detected. Make sure adapter is properly positioned (fig. 4-30); then replace key.

f. Move piston out of battery until it contacts breech ring, install adapter collar and breech lock, and return gun to battery.

g. Remove gun tube (quick-change method, TM 9-2350-215-20).

h. Visually inspect exterior machined surface of gun tube and interior surfaces of support sleeve for rust and corrosion.

NOTE

If rust pitting and large area corrosion measure more than 20 percent of bearing surface, report in detail with supporting photographs to Commander, US Army Armament Command, ATTN: AMSAR-MAW on an individual basis for evaluation and final determination of condemnation.

Note

Cannon tube is to be condemned when rust or pitting of the tube surface under the bore evacuator exceeds 80 percent of the surface area or when an individual pit exceeds a depth of 1/8 inch (0.125 inch).

Condemn cannon tube when evidence of gas leakage from beneath the bore evacuator sealing surfaces is detected. Note - Packing Preformed (2 ea) FSN 5330-955-7589 must be in serviceable condition.

i. Remove rust, corrosion, pits, and all sharp surfaces in pitted areas.

j. Inspect ring 8728296 and replace if necessary.

k. Lightly lubricate unpainted portions of gun tube support sleeve with GAA lubricant.

l. Install gun tube in mount and secure it (TM 9-2350-215-20).

m. Record data of above maintenance in the REMARKS column of DA Form 2408-4 in the equipment log book.

CHAPTER 2

REMOVAL/INSTALLATION OF ARMAMENT

Warning: **Before starting removal of cannon, clear the weapon.**

Section I. CANNON M68 AND MOUNTS M116 AND M140

2-1. Gun Tube Replacement (quick-change method)

For replacement of tube without removing cannon and mount from vehicle, refer to TM 9-2350-215-20.

2-2. Preliminary Procedures

Remove machine gun M73 (TM 9-2350-215-10), telescope M105C (M60), and M105D (M60A1) and gun shield cover (TM 9-2350-215-20).

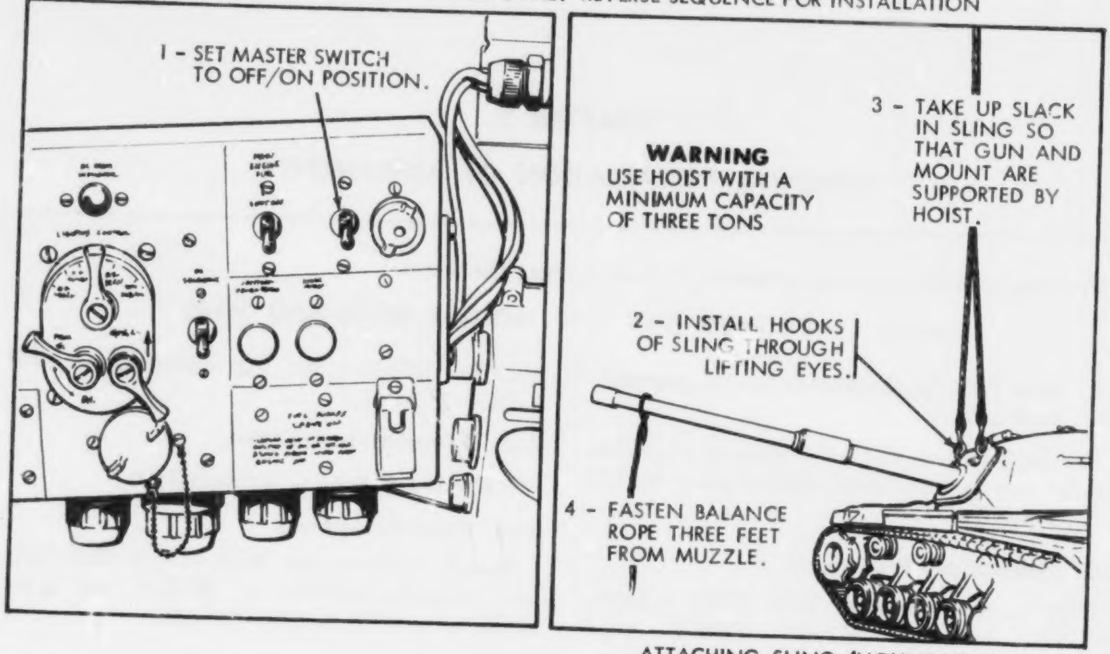
2-3. Removal/Installation

Refer to figures 2-1 through 2-10.

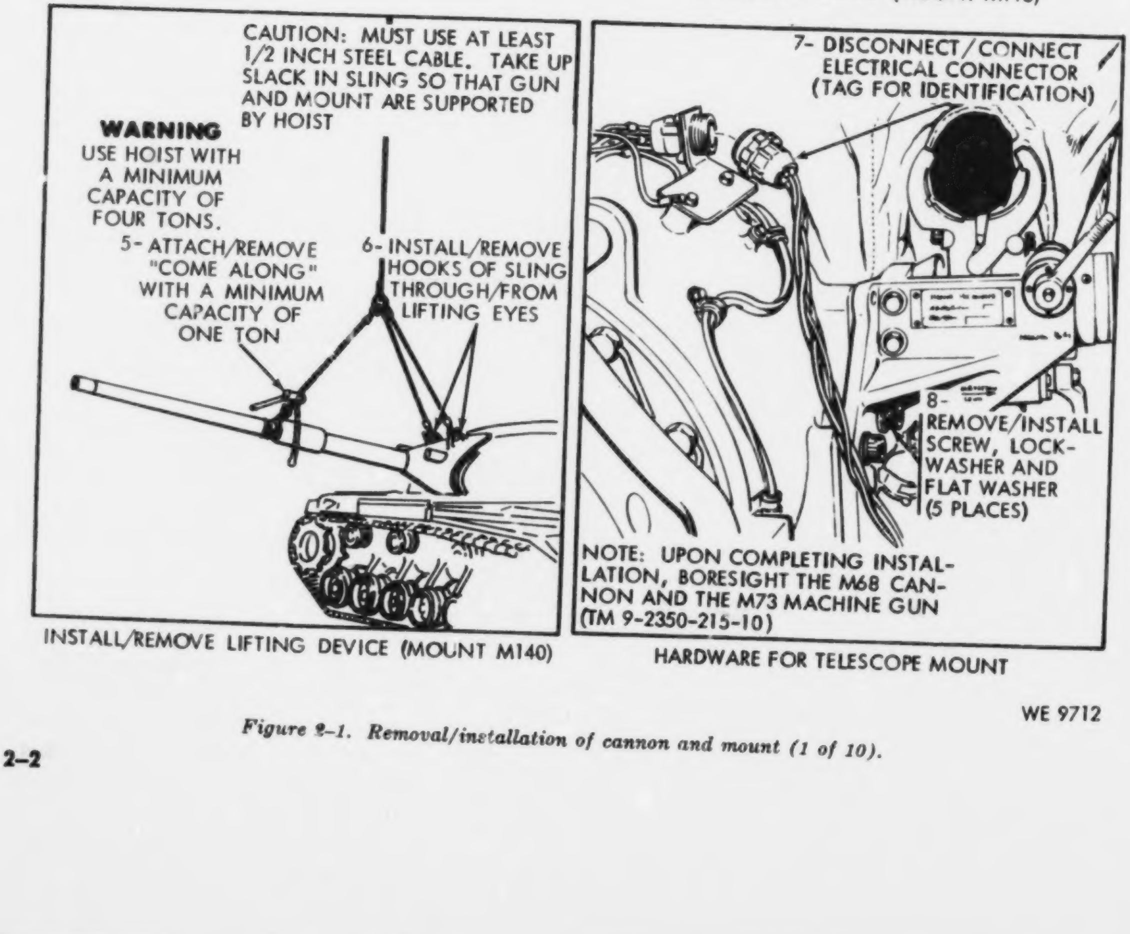
2-4. Final Procedures

Install machine gun M73 (TM 9-2350-215-10), telescope M105C or M105D and gun shield cover (TM 9-2350-215-20).

NOTE: FOLLOW NUMERIC SEQUENCE FOR REMOVAL. REVERSE SEQUENCE FOR INSTALLATION


1 - SET MASTER SWITCH TO OFF/ON POSITION.
WARNING
USE HOIST WITH A MINIMUM CAPACITY OF THREE TONS
3 - TAKE UP SLACK IN SLING SO THAT GUN AND MOUNT ARE SUPPORTED BY HOIST.
2 - INSTALL HOOKS OF SLING THROUGH LIFTING EYES.
4 - FASTEN BALANCE ROPE THREE FEET FROM MUZZLE.

ATTACHING SLING (MOUNT M116)

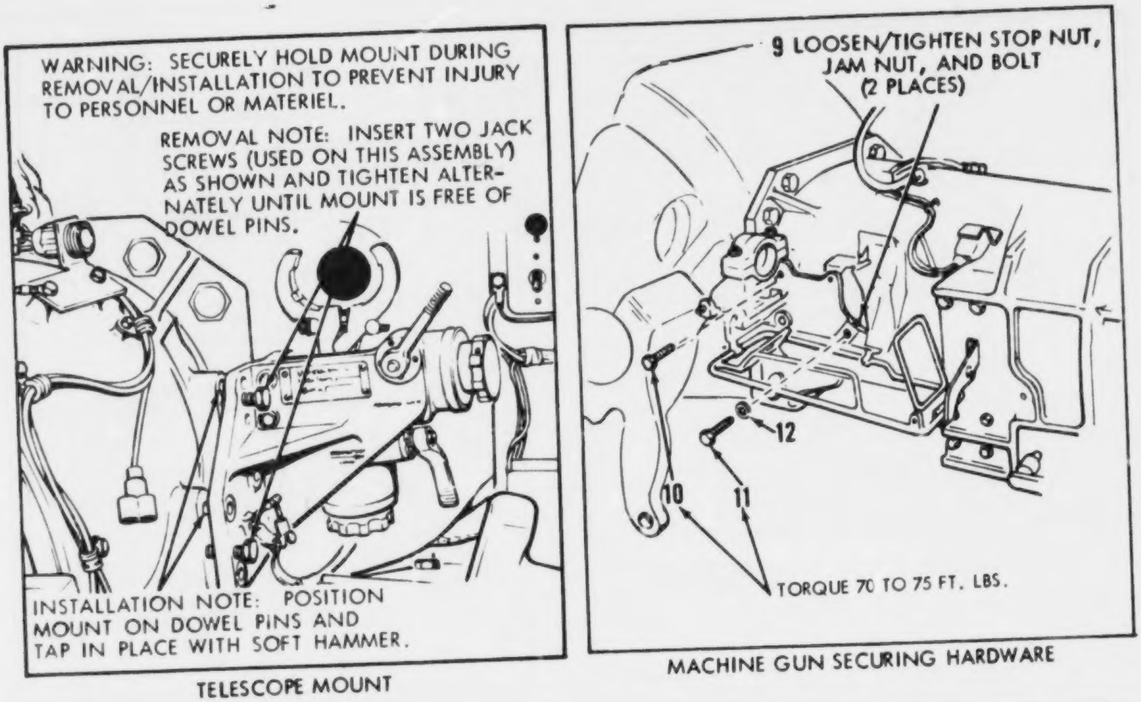

CAUTION: MUST USE AT LEAST 1/2 INCH STEEL CABLE. TAKE UP SLACK IN SLING SO THAT GUN AND MOUNT ARE SUPPORTED BY HOIST
WARNING
USE HOIST WITH A MINIMUM CAPACITY OF FOUR TONS.
5- ATTACH/REMOVE "COME ALONG" WITH A MINIMUM CAPACITY OF ONE TON
6- INSTALL/REMOVE HOOKS OF SLING THROUGH/FROM LIFTING EYES
7- DISCONNECT/CONNECT ELECTRICAL CONNECTOR (TAG FOR IDENTIFICATION)
8- REMOVE/INSTALL SCREW, LOCK-WASHER AND FLAT WASHER (5 PLACES)
NOTE: UPON COMPLETING INSTALLATION, BORESIGHT THE M68 CANNON AND THE M73 MACHINE GUN (TM 9-2350-215-10)

INSTALL/REMOVE LIFTING DEVICE (MOUNT M140)

HARDWARE FOR TELESCOPE MOUNT

WE 9712

Figure 2-1. Removal/installation of cannon and mount (1 of 10).


WARNING: SECURELY HOLD MOUNT DURING REMOVAL/INSTALLATION TO PREVENT INJURY TO PERSONNEL OR MATERIEL.

REMOVAL NOTE: INSERT TWO JACK SCREWS (USED ON THIS ASSEMBLY) AS SHOWN AND TIGHTEN ALTERNATELY UNTIL MOUNT IS FREE OF DOWEL PINS.

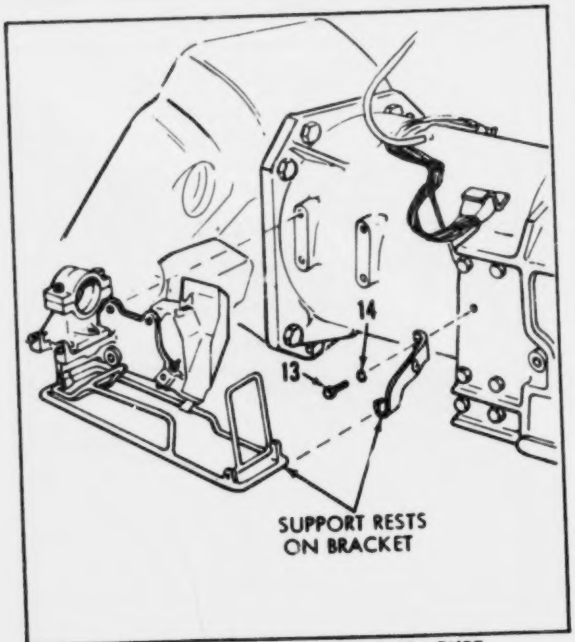
INSTALLATION NOTE: POSITION MOUNT ON DOWEL PINS AND TAP IN PLACE WITH SOFT HAMMER.

9 LOOSEN/TIGHTEN STOP NUT, JAM NUT, AND BOLT (2 PLACES)

TORQUE 70 TO 75 FT. LBS.

TELESCOPE MOUNT

MACHINE GUN SECURING HARDWARE

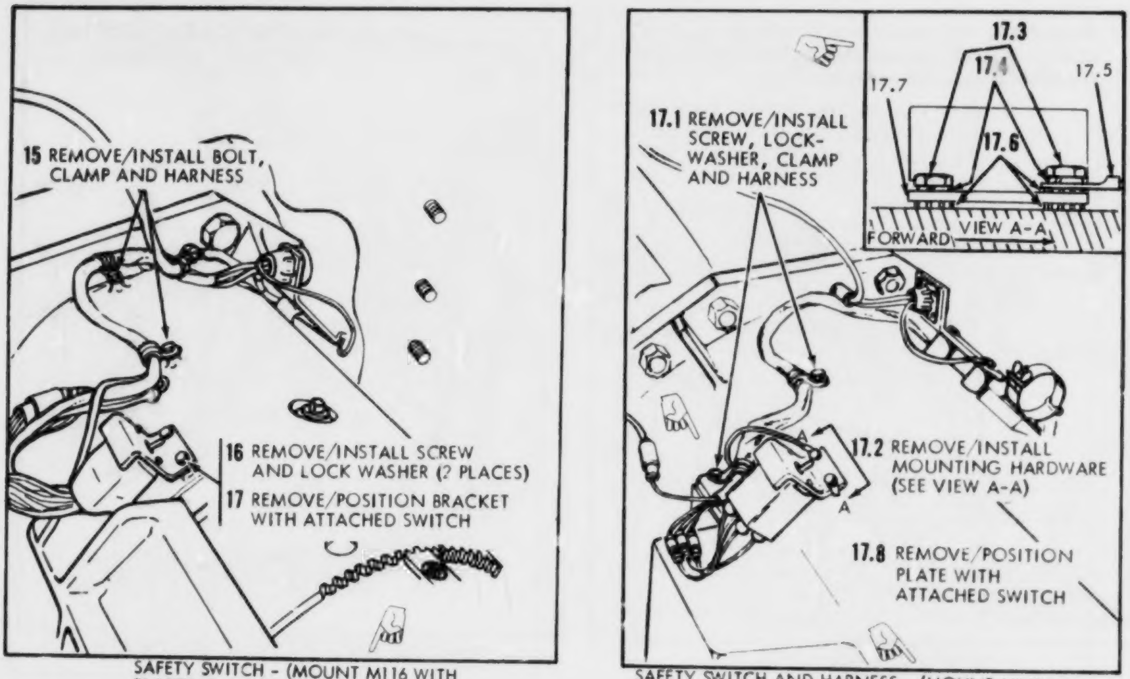

SUPPORT RESTS ON BRACKET

10 - BOLT
11 - BOLT (2)
12 - WASHER (2)
13 - SCREW (2)
14 - WASHER (2)

MACHINE GUN MOUNTING BRACKET AND SHIELD SUPPORT

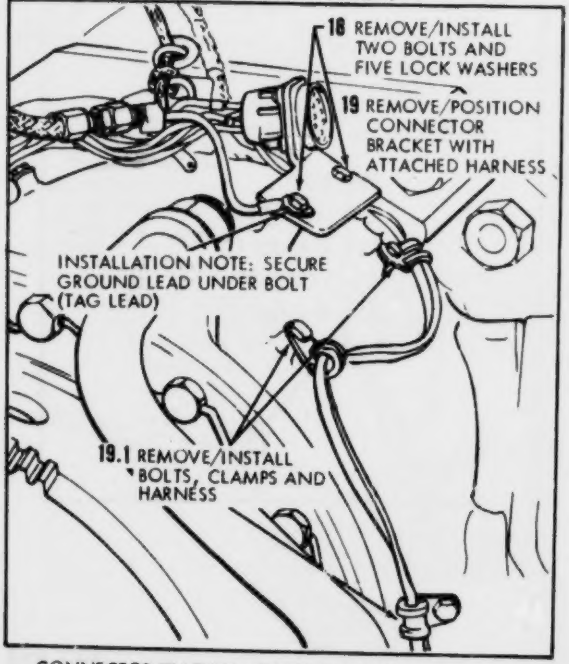
WE 67839

Figure 2-2. Removal/installation of cannon and mount (2 of 10).


15 REMOVE/INSTALL BOLT, CLAMP AND HARNESS
16 REMOVE/INSTALL SCREW AND LOCK WASHER (2 PLACES)
17 REMOVE/POSITION BRACKET WITH ATTACHED SWITCH
17.1 REMOVE/INSTALL SCREW, LOCK-WASHER, CLAMP AND HARNESS
17.3
17.4
17.7
17.5
17.6
FORWARD
VIEW A-A
A
A
17.2 REMOVE/INSTALL MOUNTING HARDWARE (SEE VIEW A-A)
17.8 REMOVE/POSITION PLATE WITH ATTACHED SWITCH

SAFETY SWITCH - (MOUNT M116 WITH BLASTING MACHINE 10884394)

SAFETY SWITCH AND HARNESS - (MOUNT M140 AND MOUNT M116 WITH BLASTING MACHINE 11599606)

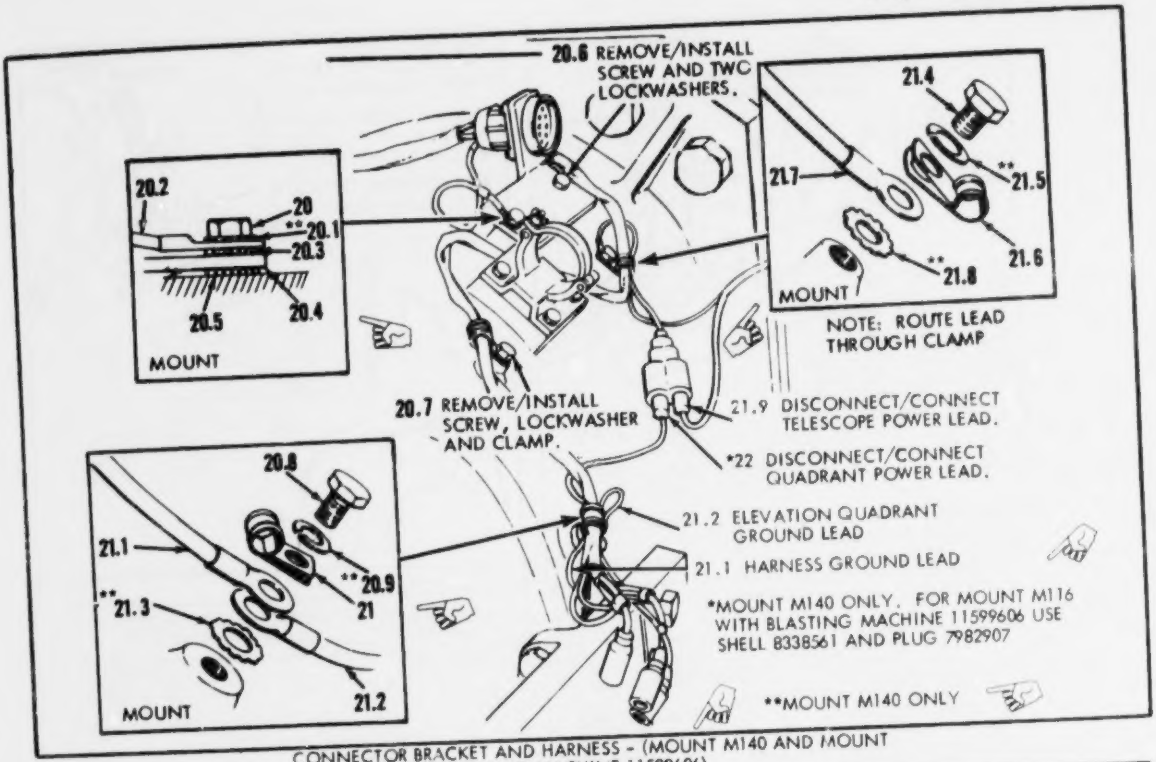

18 REMOVE/INSTALL TWO BOLTS AND FIVE LOCK WASHERS
19 REMOVE/POSITION CONNECTOR BRACKET WITH ATTACHED HARNESS
INSTALLATION NOTE: SECURE GROUND LEAD UNDER BOLT (TAG LEAD)
19.1 REMOVE/INSTALL BOLTS, CLAMPS AND HARNESS

CONNECTOR BRACKET - (MOUNT M116)

17.3 SCREW (2)
17.4 WASHER (2)
17.5 GROUND LEAD
17.6 WASHER (3)
17.7 PLATE

WE 75109

Figure 2-3. Removal/installation of cannon and mount (3 of 10).



20.6 REMOVE/INSTALL SCREW AND TWO LOCKWASHERS.

NOTE: ROUTE LEAD THROUGH CLAMP

20.7 REMOVE/INSTALL SCREW, LOCKWASHER AND CLAMP.

21.9 DISCONNECT/CONNECT TELESCOPE POWER LEAD.

*22 DISCONNECT/CONNECT QUADRANT POWER LEAD.

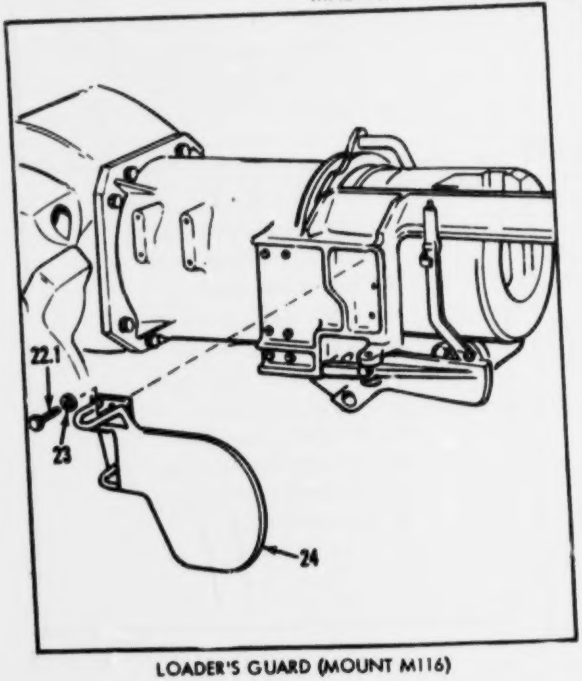
21.2 ELEVATION QUADRANT GROUND LEAD

21.1 HARNESS GROUND LEAD

*MOUNT M140 ONLY. FOR MOUNT M116 WITH BLASTING MACHINE 11599606 USE SHELL 8338561 AND PLUG 7982907

**MOUNT M140 ONLY

CONNECTOR BRACKET AND HARNESS - (MOUNT M140 AND MOUNT M116 WITH BLASTING MACHINE 11599606)

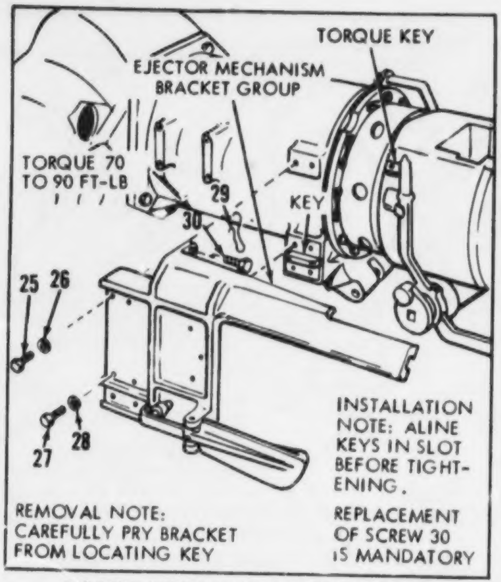


LOADER'S GUARD (MOUNT M116)

20	SCREW MS90725-5 (MOUNT M140 ONLY) BOLT 186493 (MOUNT M116 ONLY)
20.1	WASHER MS35335-33 (MOUNT M140)
20.2	GROUND LEAD
20.3	WASHER MS35335-33 (MOUNT M140 ONLY) WASHER MS45904-68 (MOUNT M116 ONLY)
20.4	BRACKET
20.5	WASHER MS35335-33 (MOUNT M140 ONLY) WASHER MS45904-68 (MOUNT M116 ONLY)
20.8	SCREW MS90725-3 (MOUNT M140 ONLY) BOLT 431953 (MOUNT M116 ONLY)
20.9	WASHER MS35338-44 (MOUNT M140 ONLY)
21	CLAMP 7725524
21.3	WASHER MS35335-33 (MOUNT M140 ONLY)
21.4	SCREW MS90725-3 (MOUNT M140 ONLY) BOLT 431953 (MOUNT M116 ONLY)
21.5	WASHER MS35338-44 (MOUNT M140 ONLY)
21.6	CLAMP 7704623
21.7	TELESCOPE GROUND LEAD
21.8	WASHER MS35335-33 (MOUNT M140 ONLY)
22.1	SCREW MS90727-111 (3)
23	WASHER MS35338-67 (3)
24	GUARD ASSEMBLY 10905058

WE 75104

Figure 2-4. Removal/installation of cannon and mount (4 of 10).

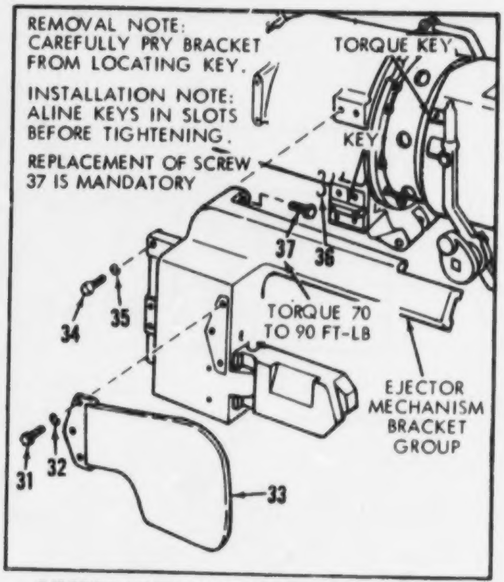

TORQUE KEY
EJECTOR MECHANISM BRACKET GROUP
TORQUE 70 TO 90 FT-LB
29
30
KEY
25
26
27
28

INSTALLATION NOTE: ALINE KEYS IN SLOT BEFORE TIGHTENING.

REMOVAL NOTE: CAREFULLY PRY BRACKET FROM LOCATING KEY

REPLACEMENT OF SCREW 30 IS MANDATORY

EJECTOR MECHANISM BRACKET GROUP (MOUNT M116)

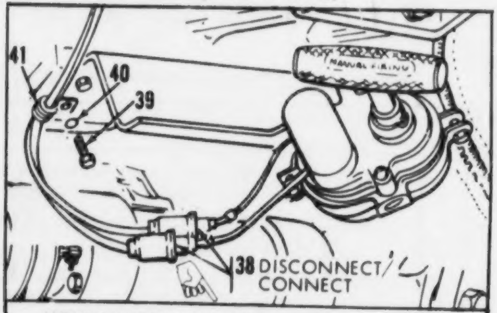

TORQUE KEY
KEY
37
36
34
35
TORQUE 70 TO 90 FT-LB
EJECTOR MECHANISM BRACKET GROUP
31
32
33

REMOVAL NOTE: CAREFULLY PRY BRACKET FROM LOCATING KEY.

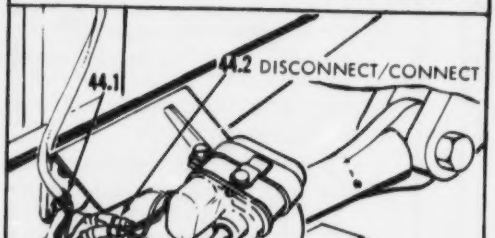
INSTALLATION NOTE: ALINE KEYS IN SLOTS BEFORE TIGHTENING.

REPLACEMENT OF SCREW 37 IS MANDATORY

EJECTOR MECHANISM BRACKET GROUP AND LOADER'S GUARD (MOUNT M140)


41
40
39
38 DISCONNECT/CONNECT

MOUNT M116 WITH BLASTING MACHINE 10884394


44.1
44.2 DISCONNECT/CONNECT
TORQUE 15 FT-LB MIN
44
43
42

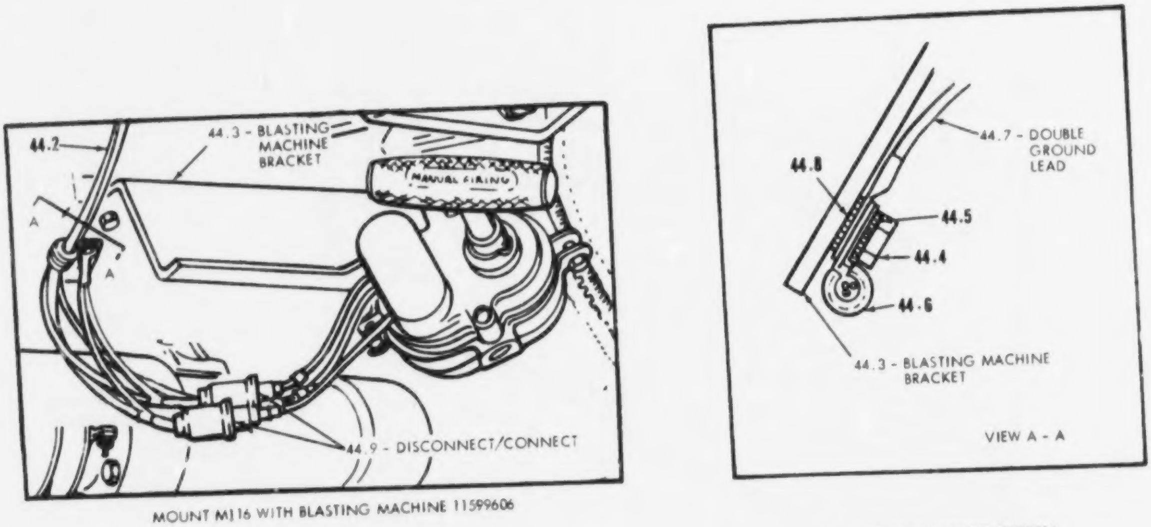
(MOUNT M140)

BLASTING MACHINE AND MOUNTING BRACKET

25 - SCREW MS90727-162 (2)
26 - WASHER MS35338-69 (2)
27 - SCREW MS90727-113 (4)
28 - WASHER MS35338-67 (4)
29 - WIRE QQ-W-461
30 - SCREW MS18153-116 (2)
31 - SCREW MS90726-111 (3)
32 - WASHER MS35338-67 (3)
33 - GUARD ASSEMBLY 10905595
34 - SCREW MS90727-117 (6)
35 - WASHER MS35338-67 (6)
36 - WIRE MS20995-F41
37 - SCREW MS18153-116 (2)
39 - SCREW MS90725-5 (4)
40 - WASHER MS 35338-44 (4)
41 - CLAMP MS21333-99
42 - BOLT MS90725-3 (4)
43 - WASHER MS45904-68 (4)
44 - WASHER MS45904-68 (4)
44.1 CLAMP 7735283

WE 75105

Figure 2-5. Removal/installation of cannon and mount (5 of 10).

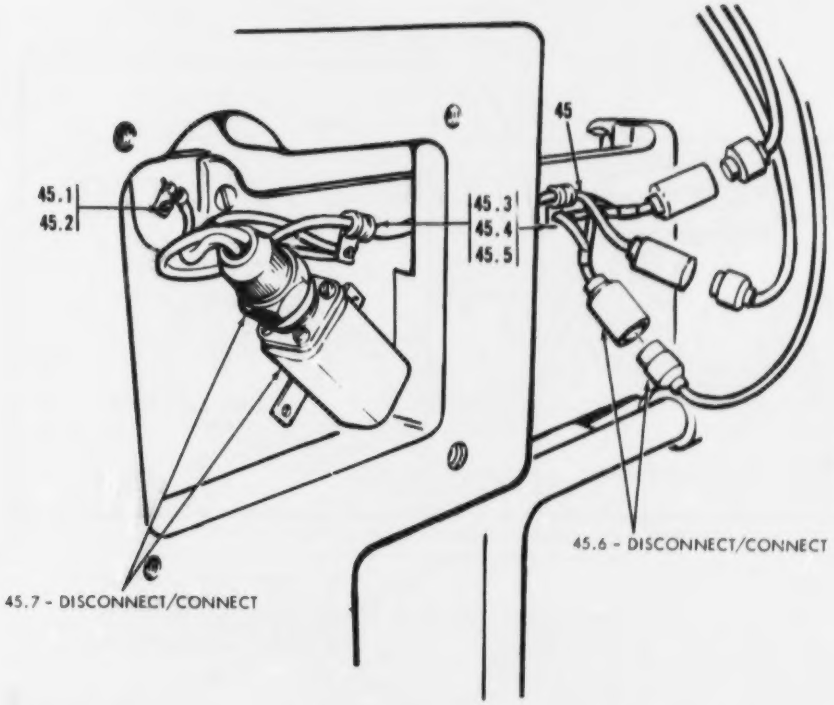

44.2
44.3 - BLASTING MACHINE BRACKET
MANUAL FIRING
A
A
44.9 - DISCONNECT/CONNECT
44.7 - DOUBLE GROUND LEAD
44.8
44.5
44.4
44.6
44.3 - BLASTING MACHINE BRACKET
VIEW A - A

MOUNT M116 WITH BLASTING MACHINE 11599606

44.2 WIRING NARNESS 11599716
44.4 SCREW MS90724-3
44.5 LOCK WASHER MS35338-44
44.6 CLAMP 7385174
44.8 LOCK WASHER MS45904-72

WE 75144

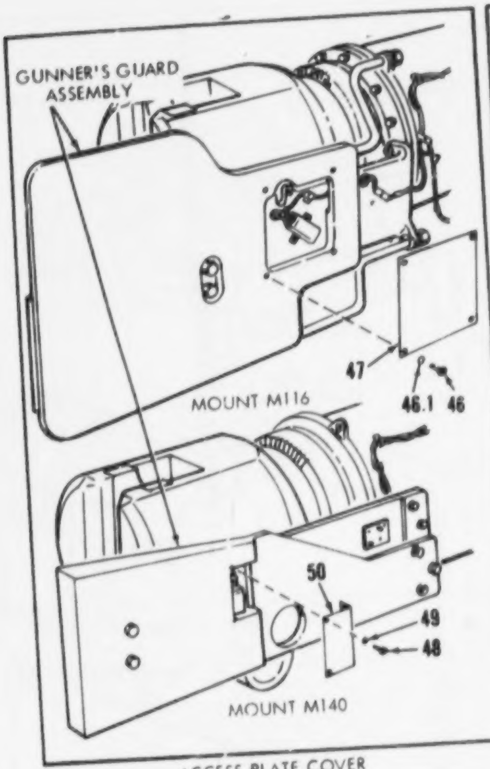
Figure 2-5.0.1. Removal/installation of cannon and mount (5.0.1 of 10).


45
45.1
45.2
45.3
45.4
45.5
45.6 - DISCONNECT/CONNECT
45.7 - DISCONNECT/CONNECT

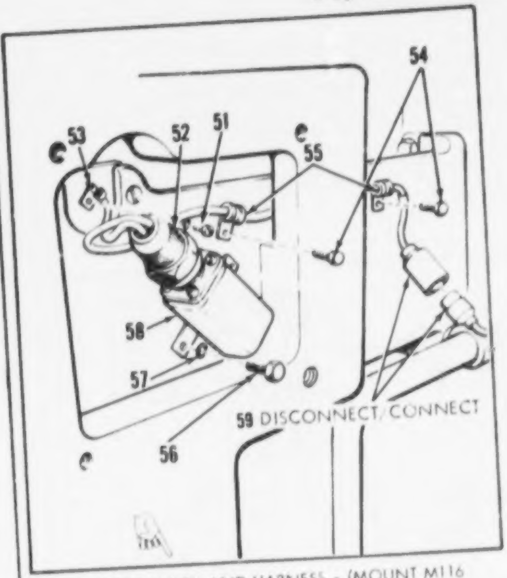
45 WIRING HARNESS 11599715
45.1 LOCK WASHER MS35335-31
45.2 SCREW 228322
45.3 BOLT 431953 (2)
45.4 LOCK WASHER MS45904-68 (2)
45.5 CLAMP 7735283 (2)

WE 75143

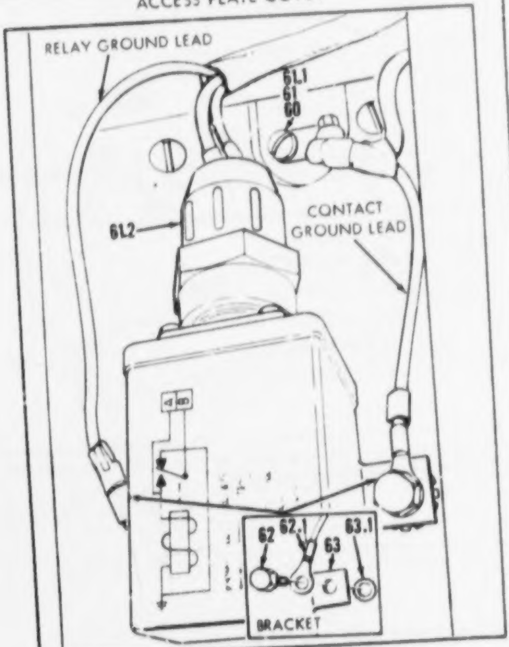
Figure 2-5.0.2. Removal/installation of cannon and mount (5.0.2 of 10).


GUNNER'S GUARD ASSEMBLY
47
46.1
46
MOUNT M116
50
49
48
MOUNT M140

ACCESS PLATE COVER


54
53
52
51
55
58
57
59 DISCONNECT/CONNECT
56

SAFETY SWITCH AND HARNESS - (MOUNT M116 WITH BLASTING MACHINE 10884394)

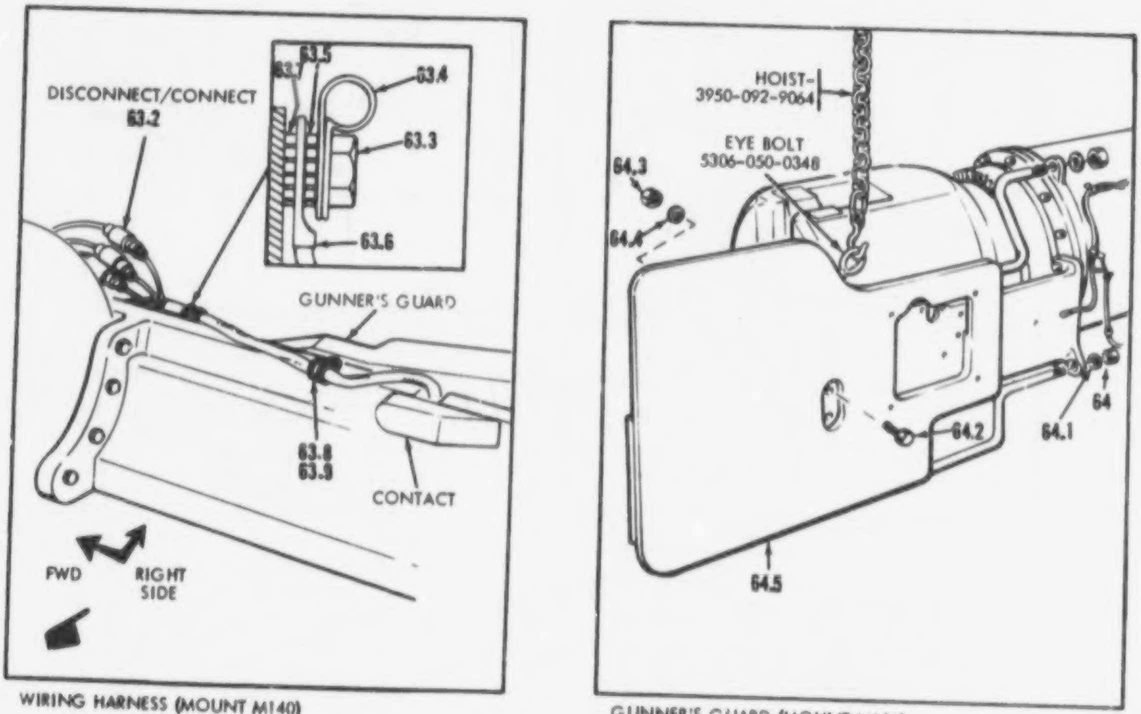

RELAY GROUND LEAD
61.1
61
60
61.2
CONTACT GROUND LEAD
62
62.1
63
63.1
BRACKET

SAFETY RELAY SWITCH (MOUNT M140)

46	SCREW (4)
46.1	WASHER (4)
47	COVER
48	SCREW (4)
49	WASHER (4)
50	COVER
51	SCREW
52	WASHER
53	LEAD ASSEMBLY
54	BOLT
55	CLAMP
56	BOLT (2)
57	WASHER (2)
58	SWITCH
60	SCREW
61	WASHER
61.1	CONTACT LEAD
61.2	WIRING HARNESS
62	SCREW
62.1	LEAD
63	RELAY SWITCH
63.1	WASHER

WE 75107

Figure 2-5.1. Removal/installation of cannon and mount (5.1 of 10).


DISCONNECT/CONNECT
63.2
63.7
63.5
63.4
63.3
63.6
GUNNER'S GUARD
63.8
63.9
CONTACT
FWD
RIGHT SIDE
HOIST-
3950-092-9064
EYE BOLT
5306-050-0348
64.3
64.4
64.2
64
64.1
64.5

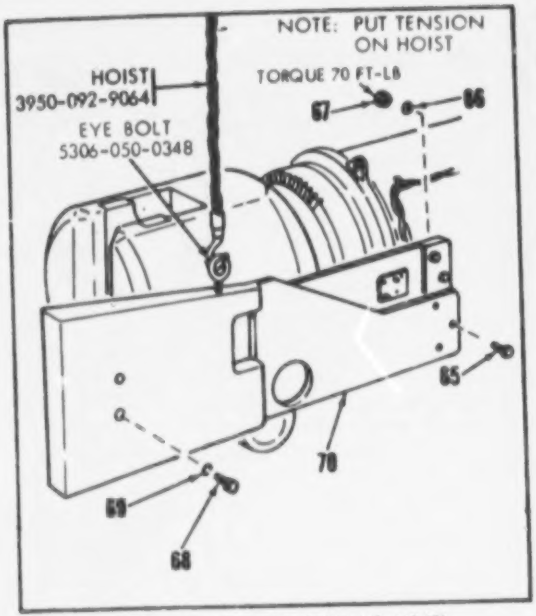
WIRING HARNESS (MOUNT M140)

GUNNER'S GUARD (MOUNT M116)

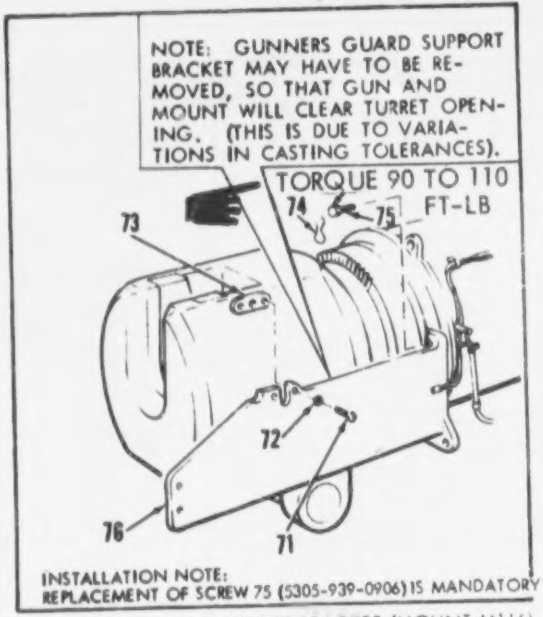
63.3	SCREW
63.4	CLAMP
63.5	WASHER
63.6	LEAD
63.7	WASHER
63.8	SCREW
63.9	CLAMP
64	NUT (2)
64.1	WASHER (2)
64.2	SCREW (2)
64.3	NUT (2)
64.4	WASHER (2)
64.5	GUARD ASSEMBLY

WE 67844

Figure 2-5.2. Removal/installation of cannon and mount (5.2 of 10).


NOTE: PUT TENSION ON HOIST
HOIST 3950-092-9064
EYE BOLT 5306-050-0348
TORQUE 70 FT-LB
67
66
65
70
69
68

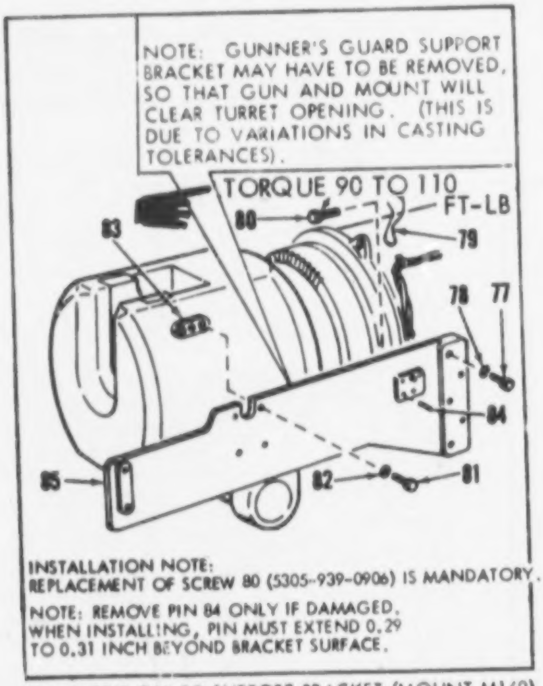
GUNNER'S GUARD (MOUNT M140)


TORQUE 90 TO 110 FT-LB
73
74
75
72
76
71

NOTE: GUNNERS GUARD SUPPORT BRACKET MAY HAVE TO BE REMOVED, SO THAT GUN AND MOUNT WILL CLEAR TURRET OPENING. (THIS IS DUE TO VARIATIONS IN CASTING TOLERANCES).

INSTALLATION NOTE:
REPLACEMENT OF SCREW 75 (5305-939-0906) IS MANDATORY

GUNNER'S GUARD SUPPORT BRACKET (MOUNT M116)


TORQUE 90 TO 110 FT-LB
80
79
83
78
77
84
85
82
81

NOTE: GUNNER'S GUARD SUPPORT BRACKET MAY HAVE TO BE REMOVED, SO THAT GUN AND MOUNT WILL CLEAR TURRET OPENING. (THIS IS DUE TO VARIATIONS IN CASTING TOLERANCES).

INSTALLATION NOTE:
REPLACEMENT OF SCREW 80 (5305-939-0906) IS MANDATORY.

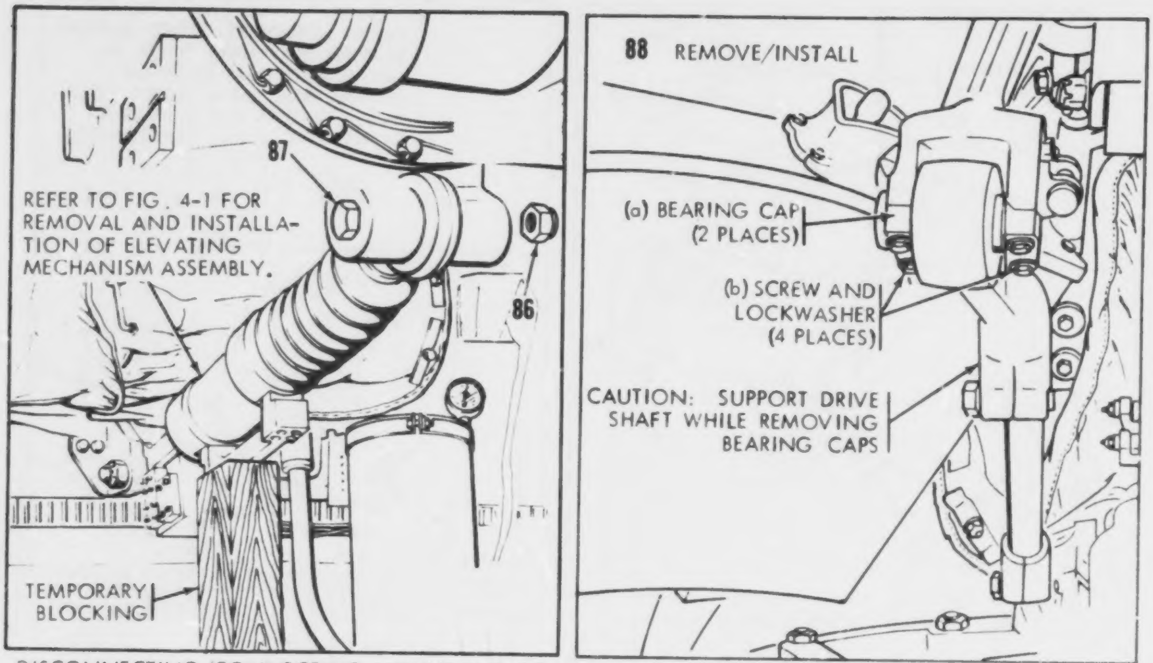
NOTE: REMOVE PIN 84 ONLY IF DAMAGED. WHEN INSTALLING, PIN MUST EXTEND 0.29 TO 0.31 INCH BEYOND BRACKET SURFACE.

GUNNER'S GUARD SUPPORT BRACKET (MOUNT M140)

65 - SCREW MS90727-118 (3)
66 - WASHER MS35338-67 (3)
67 - NUT MS51968-15 (2)
68 - SCREW MS90727-113 (2)
69 - WASHER MS35338-67 (2)
70 - GUARD ASSEMBLY 10705582
71 - SCREW MS35191-272 (2)
72 - WASHER MS35336-21 (2)
73 - CONTACT ASSEMBLY 10884271
74 - WIRE QQ-W-461
75 - SCREW MS18153-116 (6)
76 - BRACKET 10884103
77 - SCREW MS90727-115 (2)
78 - WASHER MS35338-67 (2)
79 - WIRE MS20995-F41
80 - SCREW MS18153-116 (6)
81 - SCREW MS35191-272 (2)
82 - WASHER MS35336-21 (2)
83 - CONTACT ASSEMBLY 10884271
84 - PIN 141153 (2)
85 - BRACKET 10905494

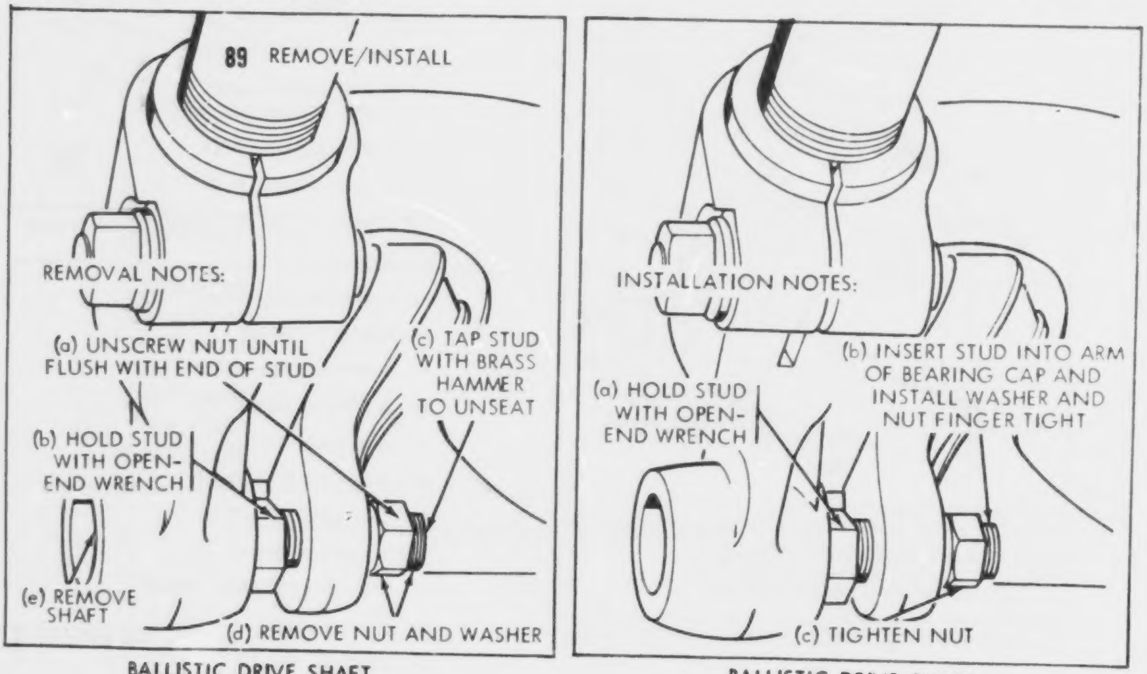
AR 900615

Figure 2-6. Removal/installation of cannon and mount (6 of 10).


87
REFER TO FIG. 4-1 FOR REMOVAL AND INSTALLATION OF ELEVATING MECHANISM ASSEMBLY.
86
TEMPORARY BLOCKING
88 REMOVE/INSTALL
(a) BEARING CAP (2 PLACES)
(b) SCREW AND LOCKWASHER (4 PLACES)
CAUTION: SUPPORT DRIVE SHAFT WHILE REMOVING BEARING CAPS

DISCONNECTING/CONNECTING MOUNT END OF ELEVATING MECHANISM ASSEMBLY.

BALLISTIC DRIVE SHAFT BEARING CAPS


89 REMOVE/INSTALL
REMOVAL NOTES:
(a) UNSCREW NUT UNTIL FLUSH WITH END OF STUD
(b) HOLD STUD WITH OPEN-END WRENCH
(c) TAP STUD WITH BRASS HAMMER TO UNSEAT
(d) REMOVE NUT AND WASHER
(e) REMOVE SHAFT
INSTALLATION NOTES:
(a) HOLD STUD WITH OPEN-END WRENCH
(b) INSERT STUD INTO ARM OF BEARING CAP AND INSTALL WASHER AND NUT FINGER TIGHT
(c) TIGHTEN NUT

BALLISTIC DRIVE SHAFT

BALLISTIC DRIVE SHAFT

86 - NUT MS21044-N18

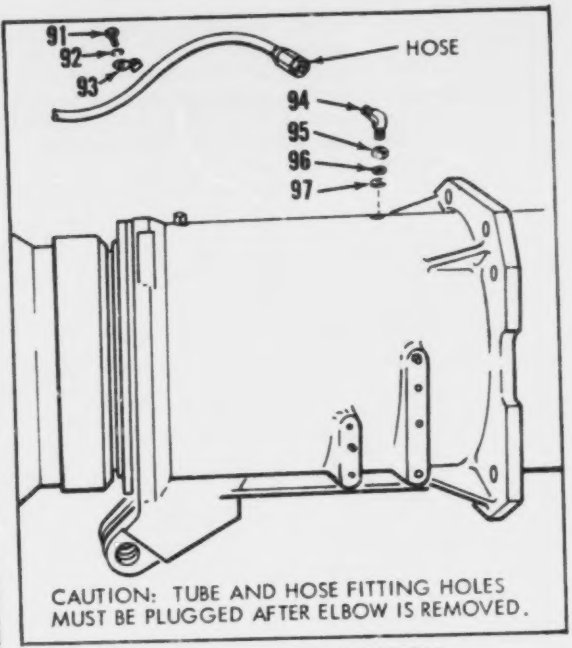
87 - BOLT 10870534

WE 73703

Figure 2-7. Removal/installation of cannon and mount (7 of 10).

90 FOR REMOVAL/INSTALLATION OF REPLENISHER ASSEMBLY; REFER TO TM 9-2350-215-20

REPLENISHER ASSEMBLY



CAUTION: TUBE AND HOSE FITTING HOLES MUST BE PLUGGED AFTER ELBOW IS REMOVED.

REPLENISHER CONNECTION

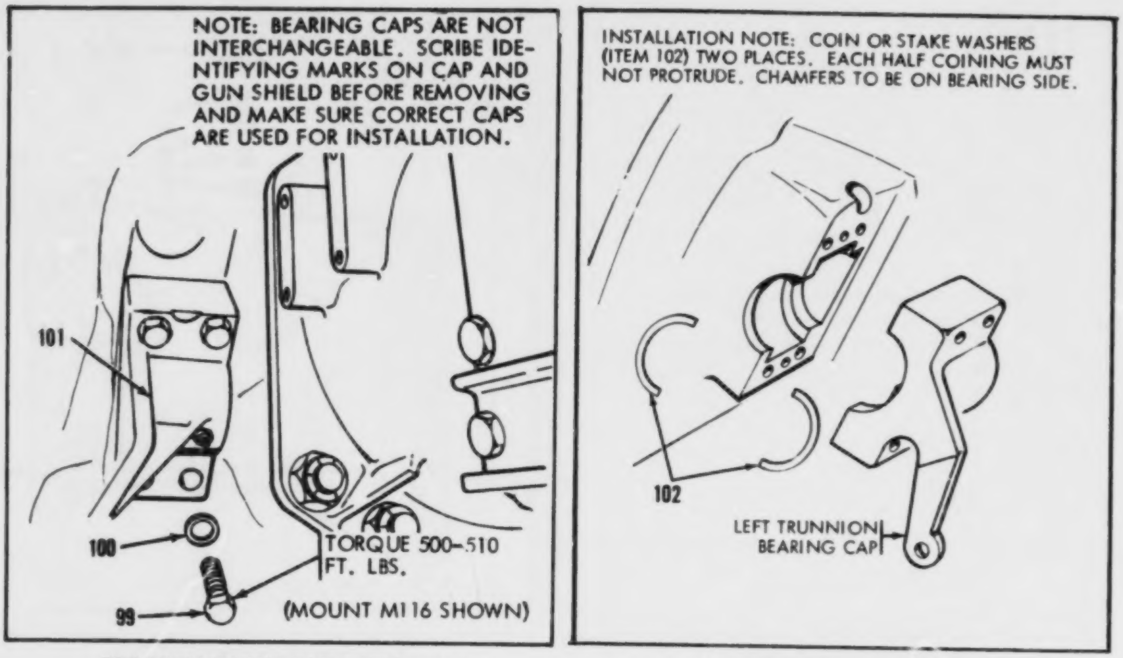
98 FOR REMOVAL/INSTALLATION OF BALLISTIC SHIELD REFER TO: TM 9-2350-215-20

BALLISTIC SHIELD

91 - SCREW (Mount M140 only)
92 - WASHER (Mount M140 only)
93 - CLAMP (Mount M140 only)
94 - ELBOW
95 - LOCKNUT
96 - WASHER
97 - PACKING

WE 67898

Figure 2-8. Removal / installation of cannon and mount (8 of 10).


101
100
99
102
LEFT TRUNNION BEARING CAP

NOTE: BEARING CAPS ARE NOT INTERCHANGEABLE. SCRIBE IDENTIFYING MARKS ON CAP AND GUN SHIELD BEFORE REMOVING AND MAKE SURE CORRECT CAPS ARE USED FOR INSTALLATION.

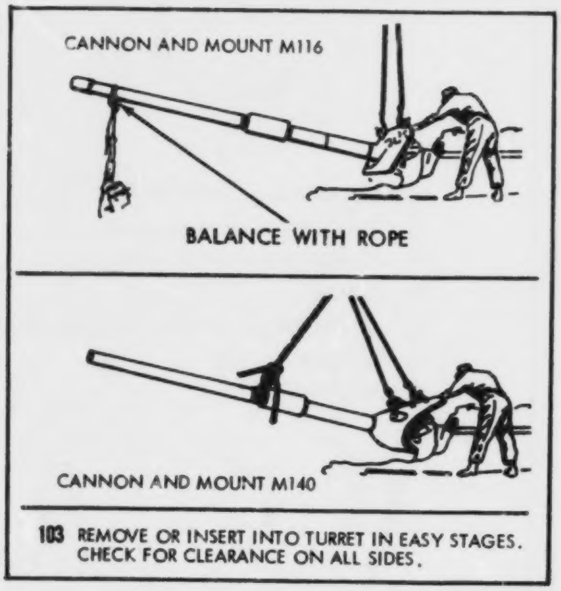
TORQUE 500-510 FT. LBS.

(MOUNT M116 SHOWN)

INSTALLATION NOTE: COIN OR STAKE WASHERS (ITEM 102) TWO PLACES. EACH HALF COINING MUST NOT PROTRUDE. CHAMFERS TO BE ON BEARING SIDE.

TRUNNION BEARING CAPS (LEFT SHOWN)

TRUNNION THRUST WASHERS (MOUNT M140 ONLY)


CANNON AND MOUNT M116
BALANCE WITH ROPE
CANNON AND MOUNT M140

103 REMOVE OR INSERT INTO TURRET IN EASY STAGES. CHECK FOR CLEARANCE ON ALL SIDES.

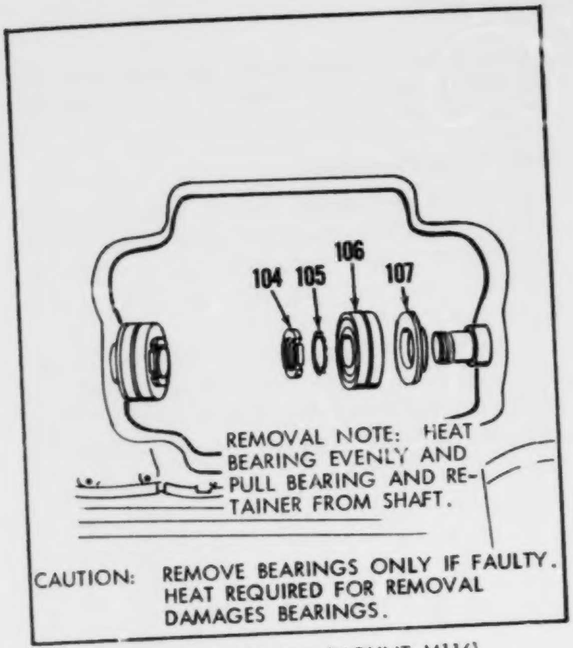
NOTE: WHEN PROPERLY INSTALLED, SHIELD RESTS ON TRUNNION BEARINGS, NOT ON BEARING RETAINERS.

CAUTION: CLEAR WORK AREA OF ALL LOOSE PARTS AND TOOLS. PROVIDE TWO SAWHORSES TO ACCOMMODATE GUN AND MOUNT. BE CAREFUL NOT TO DAMAGE TRUNNION BEARINGS AND RETAINERS.

99 - SCREW (4) PER CAP
100 - WASHER (4) PER CAP
101 - CAP (2)
102 - THRUST WASHER (2)

WE 67899

Figure 2-9. Removal / installation of cannon and mount (9 of 10).



REMOVAL NOTE: HEAT BEARING EVENLY AND PULL BEARING AND RETAINER FROM SHAFT.

CAUTION: REMOVE BEARINGS ONLY IF FAULTY. HEAT REQUIRED FOR REMOVAL DAMAGES BEARINGS.

TRUNNION BEARINGS (MOUNT M116)

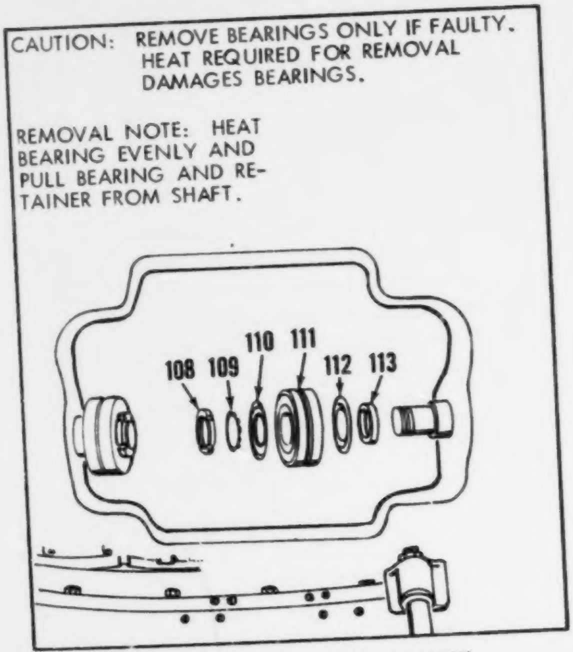
INSTALLATION NOTES:

A - Replace bearing retainer on shaft.

B - Heat bearing to 250° F by submerging in a hot oil bath and install it on trunnion pin. Then pack with Grease, Automotive and Artillery (GAA).

C - Install washer and round nut.

104 - NUT (2)
105 - WASHER (2)
106 - BEARING (2)
107 - RETAINER ASSEMBLY (2)



CAUTION: REMOVE BEARINGS ONLY IF FAULTY. HEAT REQUIRED FOR REMOVAL DAMAGES BEARINGS.

REMOVAL NOTE: HEAT BEARING EVENLY AND PULL BEARING AND RETAINER FROM SHAFT.

TRUNNION BEARINGS (MOUNT M140)

INSTALLATION NOTES:

A - Install space ring and dust shield.

B - Heat bearing to 250° F by submerging in hot oil bath and install it on trunnion pin. Pack with Grease, Automotive and Artillery (GAA).

C - Install dust shield, washer, and round nut.

108 - NUT (2)
109 - WASHER (2)
110 - SHIELD (2)
111 - BEARING (2)
112 - SHIELD (2)
113 - RING (2)

WE 9721

Figure 2-10. Removal/installation of cannon and mount (10 of 10).

Section II. CUPOLA M19

2-5. Preliminary Procedures

a. Remove periscope M28C, periscope guard, and machine gun M85 (TM 9-2350-215-10). Remove periscope mount M104A1 (TM 9-6175). (Procedures applicable to M60 vehicle serial numbers 1 through 184).

b. Remove periscope M34 or M36 and machine gun M85 (TM 9-2350-215-10). Remove periscope mount M119 (TM 9-1240-272-35). (Procedures applicable to M60 vehicle serial numbers 185 up and all M60A1's).

2-6. Removal/Installation

Refer to figures 211 through 2-16.

Note. When removing cupola M19 from tank M60 and M60A1 turret, it is necessary to first partially disassemble and remove electrical system (fig. 2-11).

2-7. Final Procedures

a. Install periscope mount M140A1 (TM 9-6175). Install machine gun M85, periscope M28C, and periscope guard (TM 9-2350-215-10). (Applicable to M60 vehicle serial numbers 1 through 184).

b. Install periscope mount M119 (TM 9-1240-272-35). Install machine gun M85 and periscope M34 and M36 (TM 9-2350-215-10). (Applicable to M60 vehicle serial numbers 185 up and all M60A1's.

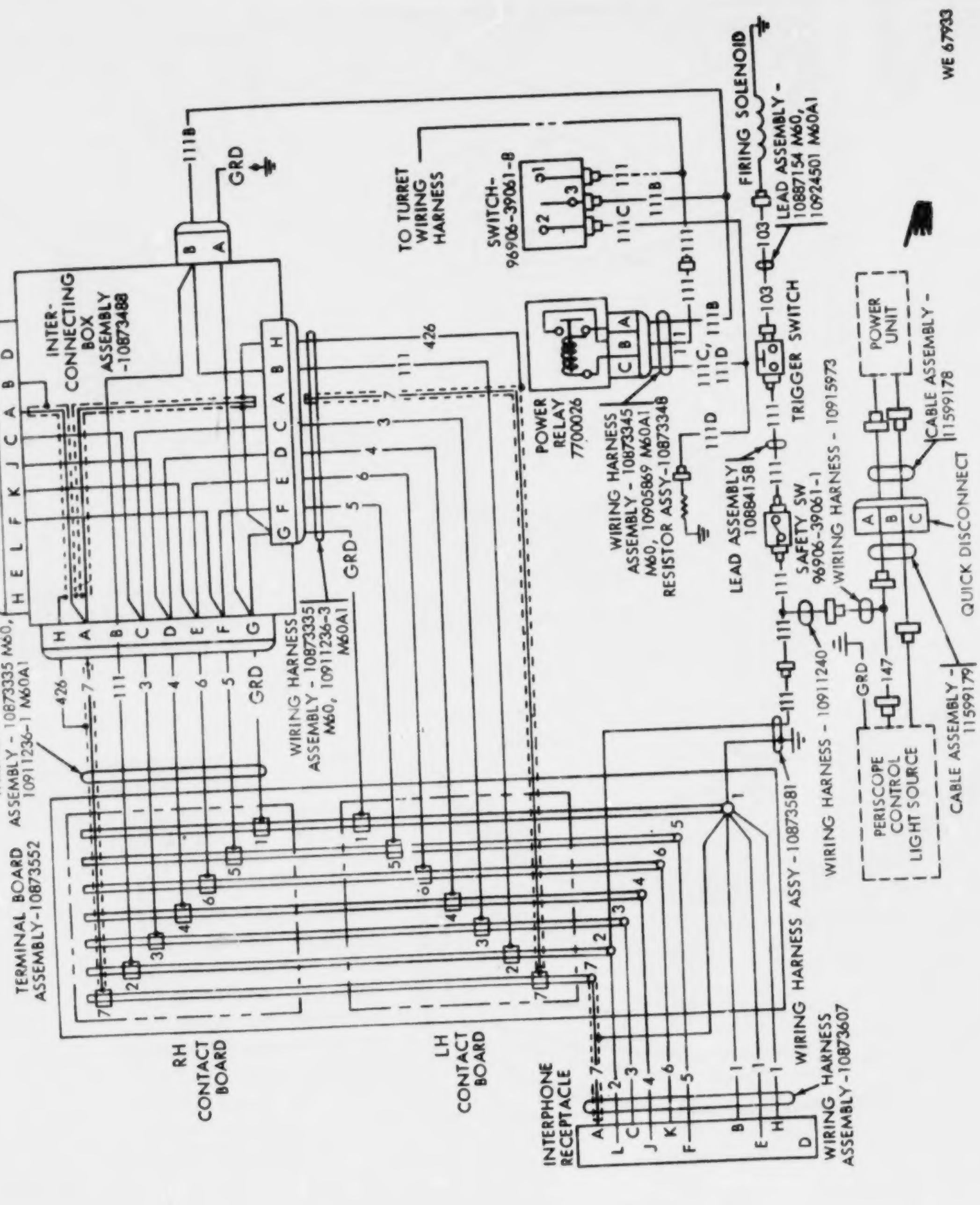
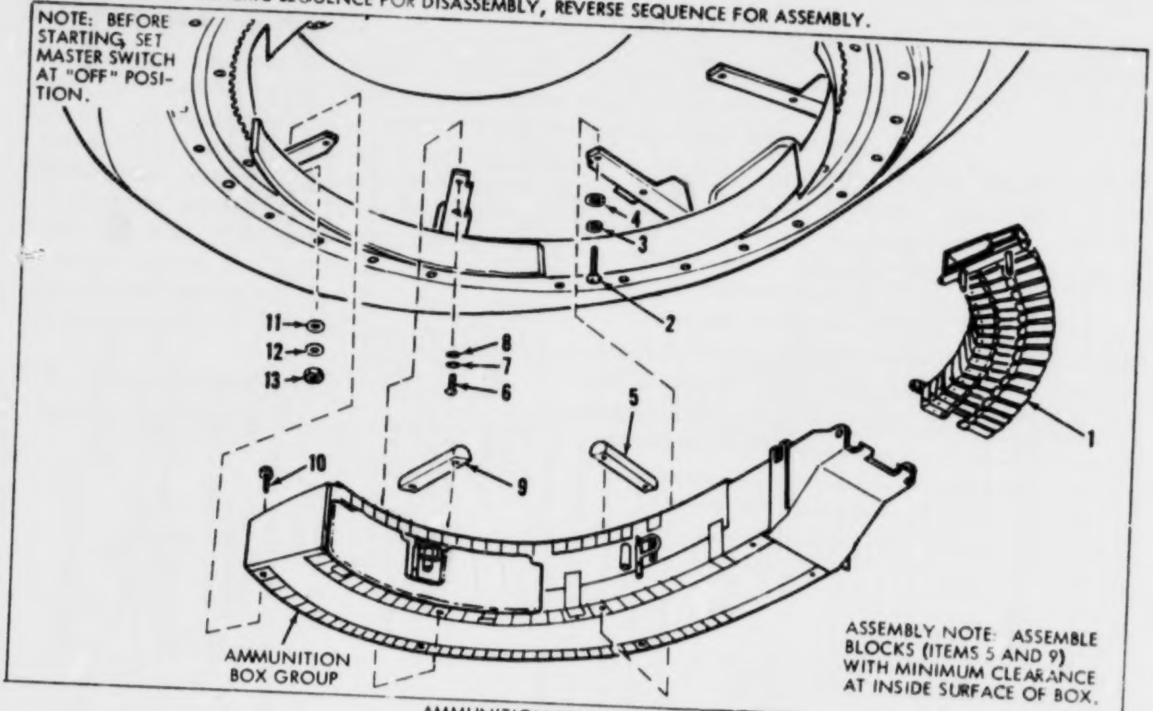

TO COMMANDER'S CONTROL BOX
H E L F K J C A B D
INTER-CONNECTING BOX ASSEMBLY -10873488
111B
GRD
B
A
TO TURRET WIRING HARNESS
SWITCH-96906-39061-8
1 2 3
111C 111
111B
111
FIRING SOLENOID
LEAD ASSEMBLY - 10887154 M60, 10924501 M60A1
103
TRIGGER SWITCH
POWER RELAY 7700026
C B A
111C, 111D
111, 111B
426
WIRING HARNESS ASSEMBLY - 10873345 M60, 10905869 M60A1
RESISTOR ASSY-10873348
111D
LEAD ASSEMBLY 10884158
SAFETY SW 96906-39061-1
WIRING HARNESS - 10915973
POWER UNIT
CABLE ASSEMBLY - 11599178
QUICK DISCONNECT
A B C
CABLE ASSEMBLY - 11599179
PERISCOPE CONTROL LIGHT SOURCE
GRD
147
WIRING HARNESS - 10911240
WIRING HARNESS ASSY - 10873581
G F E D C A B H
GRD
WIRING HARNESS ASSEMBLY - 10873335 M60, 10911236-3 M60A1
WIRING HARNESS ASSEMBLY - 10873335 M60, 10911236-1 M60A1
H A B C D E F G
426 7 111 3 4 6 5 GRD
TERMINAL BOARD ASSEMBLY-10873552
RH CONTACT BOARD
LH CONTACT BOARD
1 5 6 4 3 2 7
INTERPHONE RECEPTACLE
A L C J K F B E H D
7 2 3 4 6 5 1 1 1
WIRING HARNESS ASSEMBLY-10873607
WE 67933

Figure 2-11. Cupola electrical system wiring diagram.

NOTE: FOLLOW NUMERIC SEQUENCE FOR DISASSEMBLY, REVERSE SEQUENCE FOR ASSEMBLY.

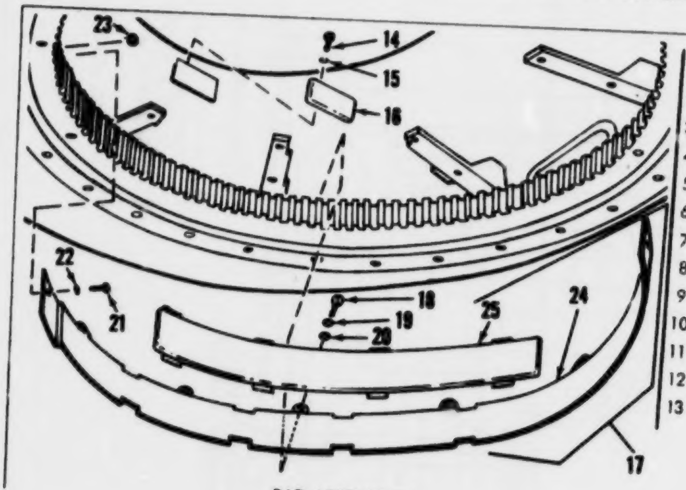


NOTE: BEFORE STARTING, SET MASTER SWITCH AT "OFF" POSITION.

AMMUNITION BOX GROUP

ASSEMBLY NOTE: ASSEMBLE BLOCKS (ITEMS 5 AND 9) WITH MINIMUM CLEARANCE AT INSIDE SURFACE OF BOX.

AMMUNITION FEED SYSTEM

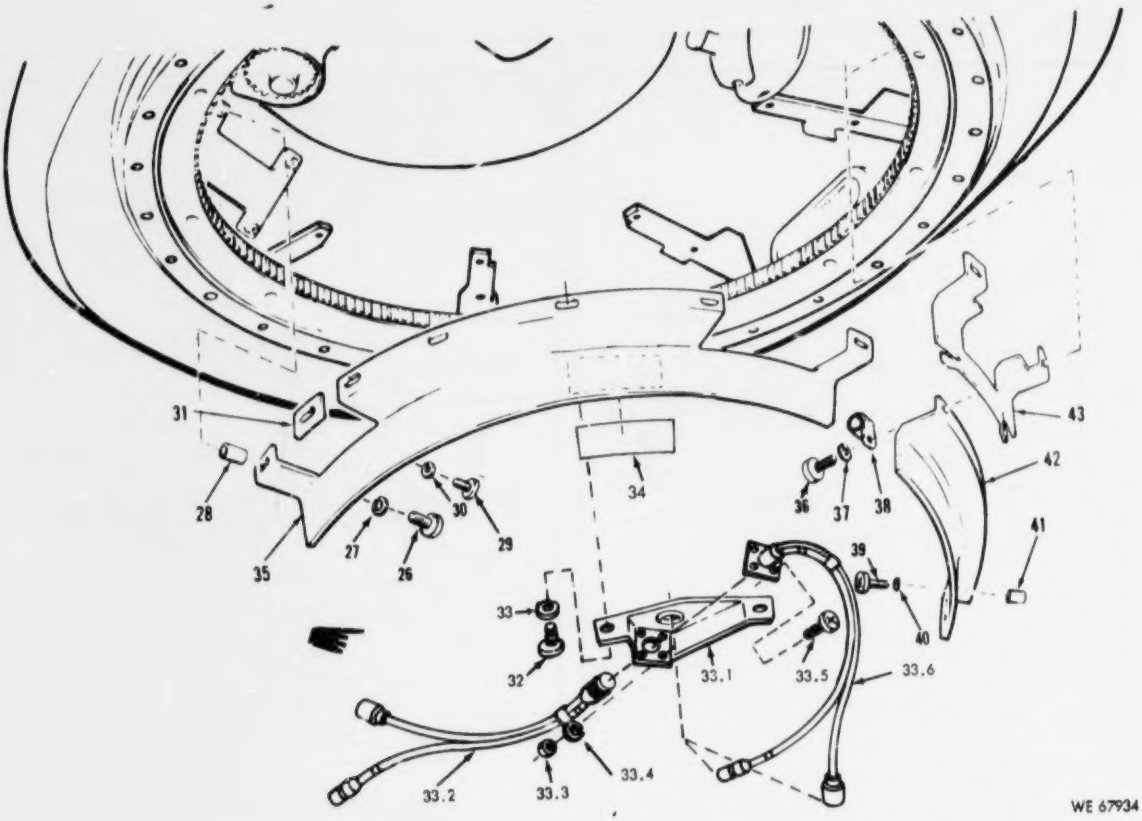


1 - CHUTE
2 - SCREW (4)
3 - WASHER (4)
4 - WASHER (4)
5 - BLOCK (2)
6 - SCREW (2)
7 - WASHER (2)
8 - WASHER (2)
9 - BLOCK
10 - SCREW (2)
11 - WASHER (2)
12 - WASHER (2)
13 - NUT (2)
14 - SCREW (2) (M60A1 only)
15 - WASHER (2) (M60A1 only)
16 - PAD ASSEMBLY (M60A1 only)
17 - PAD ASSEMBLY
18 - SCREW (6)
19 - WASHER (6)
20 - WASHER (6)
21 - SCREW (2)
22 - WASHER (2)
23 - NUT (2)
24 - GUARD
25 - PAD ASSEMBLY

PAD ASSEMBLIES

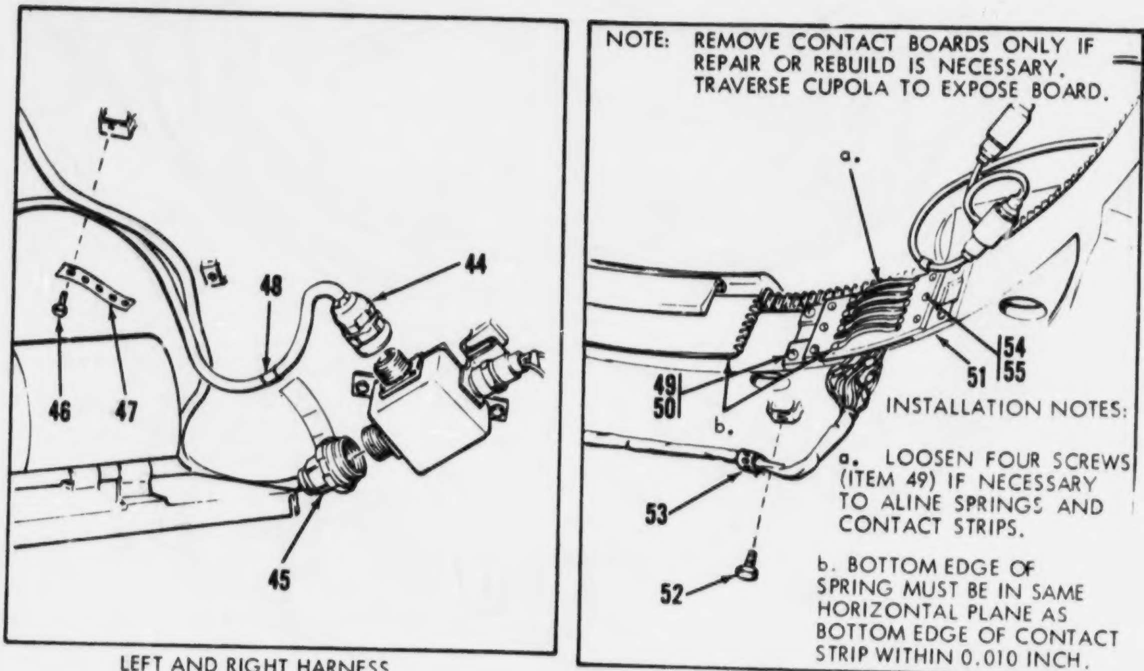
WE 67900

Figure 2-12. Removal/installation of cupola M19 (1 of 5).


31
28
35
27
26
30
29
34
36
37
38
43
42
41
39
40
33
32
33.1
33.5
33.6
33.2
33.3
33.4
WE 67934

LEGEND to fig. 2-13:
26 —Screw
27 —Washer
28 —Insert
29 —Screw
30 —Washer
31 —Plate
32 —Screw (5)
33 —Washer (5)
33.1—Bracket
33.2—Lead
33.3—Nut (4)
33.4—Washer (4)
33.5—Screw (4)
33.6—Lead
34 —Decal
35 —Guard Assembly
36 —Screw (2)
37 —Washer (2)
38 —Clamp
39 —Screw
40 —Washer
41 —Insert
42 —Guard Assembly
43 —Guard

Figure 2-13. Removal/installation of cupola M19 (2 of 5).



NOTE: REMOVE CONTACT BOARDS ONLY IF REPAIR OR REBUILD IS NECESSARY. TRAVERSE CUPOLA TO EXPOSE BOARD.

INSTALLATION NOTES:

a. LOOSEN FOUR SCREWS (ITEM 49) IF NECESSARY TO ALINE SPRINGS AND CONTACT STRIPS.

b. BOTTOM EDGE OF SPRING MUST BE IN SAME HORIZONTAL PLANE AS BOTTOM EDGE OF CONTACT STRIP WITHIN 0.010 INCH.

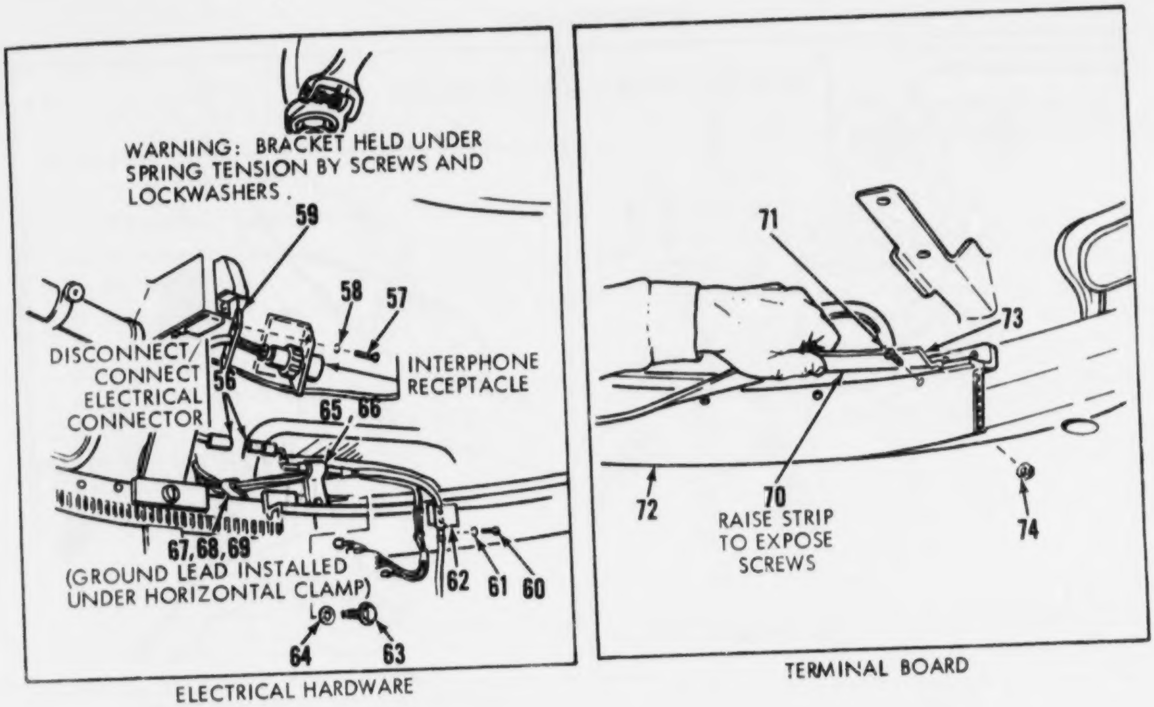
LEFT AND RIGHT HARNESS

RIGHT AND LEFT CONTACT BOARDS (LEFT SHOWN)

WE 1291

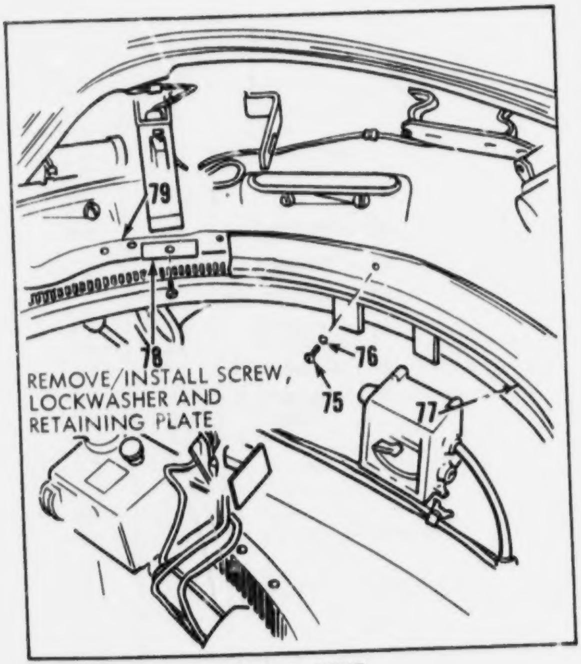
LEGEND to fig. 2-14:
44—Wiring harness
45—Wiring harness
46—Bolt (2 for M60)
47—Clamp (2 for M60)
    Strap (1 for M60A1)
48—Band (2)
49—Screw (4 per board)
50—Washer (4 per board)
51—Bracket (2 per board)
52—Bolt (8)
53—Clamp (4 for M60)
    Strap (4 for M60A1)
54—Screw (6 per board)
55—Washer (6 per board)

Figure 2-14. Removal/installation of cupola M19 (3 of 5).


WARNING: BRACKET HELD UNDER SPRING TENSION BY SCREWS AND LOCKWASHERS.
59
58
57
DISCONNECT/CONNECT ELECTRICAL CONNECTOR
56
INTERPHONE RECEPTACLE
65, 66
67, 68, 69
(GROUND LEAD INSTALLED UNDER HORIZONTAL CLAMP)
62
61
60
64
63
71
73
72
70
RAISE STRIP TO EXPOSE SCREWS
74

ELECTRICAL HARDWARE

TERMINAL BOARD

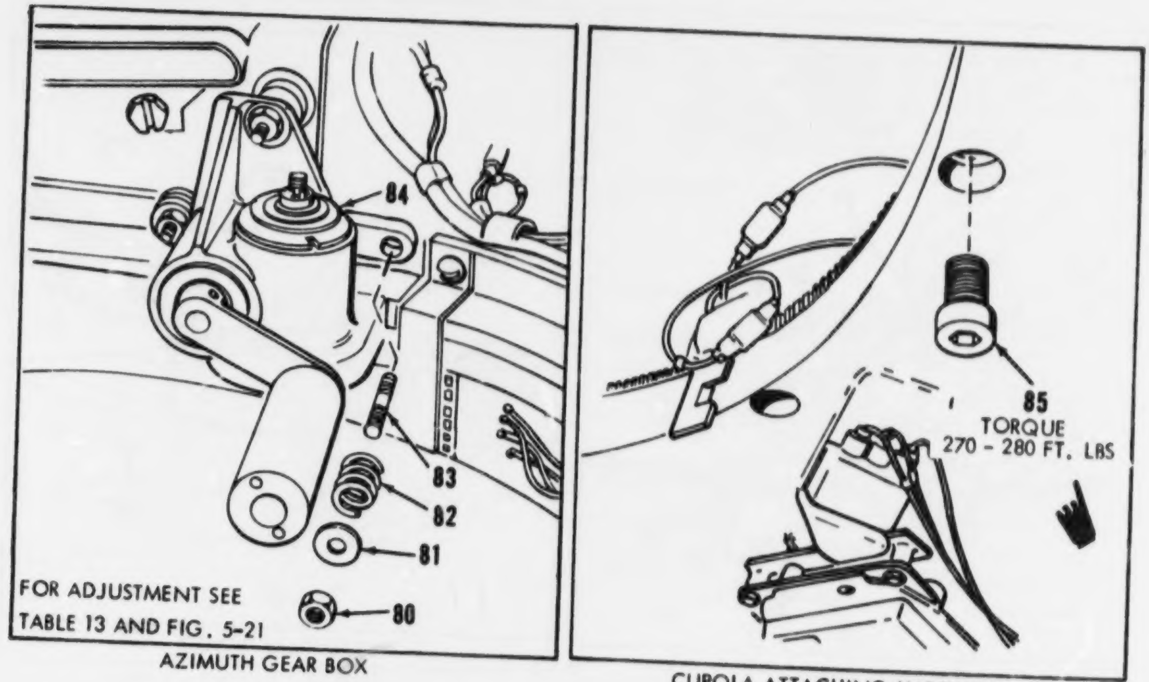

79
78
REMOVE/INSTALL SCREW, LOCKWASHER AND RETAINING PLATE
76
75
77

SEALING STRIP

57 - SCREW (2)
58 - WASHER (2)
59 - BRACKET
60 - SCREW (2)
61 - WASHER (2)
62 - CLAMP
63 - SCREW
64 - WASHER
65 - CLAMP
66 - WASHER
67 - BOLT
68 - CLAMP
69 - WASHER
71 - SCREW (13)
72 - TERMINAL
73 - STRIP
74 - NUT (13)
75 - SCREW (12)
76 - WASHER (12)
77 - SUPPORT
79 - STRIP

WE 12920

Figure 2-15. Removal/installation of cupola M19 (4 of 5).

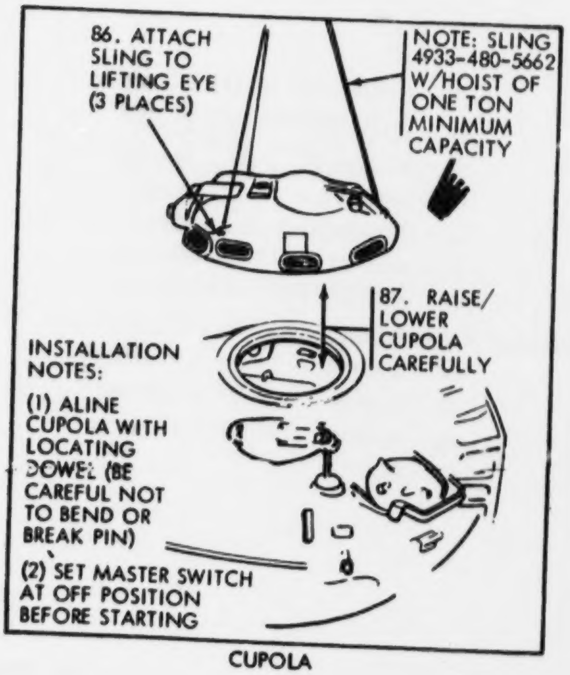


FOR ADJUSTMENT SEE TABLE 13 AND FIG. 5-21

TORQUE 270 - 280 FT. LBS

AZIMUTH GEAR BOX

CUPOLA ATTACHING HARDWARE



86. ATTACH SLING TO LIFTING EYE (3 PLACES)

NOTE: SLING 4933-480-5662 W/HOIST OF ONE TON MINIMUM CAPACITY

87. RAISE/LOWER CUPOLA CAREFULLY

INSTALLATION NOTES:

(1) ALINE CUPOLA WITH LOCATING DOWEL (BE CAREFUL NOT TO BEND OR BREAK PIN)

(2) SET MASTER SWITCH AT OFF POSITION BEFORE STARTING

CUPOLA

80 - NUT (3)
81 - WASHER (2)
82 - SPRING (3)
83 - STUD (3)
84 - GEAR BOX
85 - SCREW (12)

WE 67935

Figure 2-16. Removal/installation of cupola M19 (5 of 5).

CHAPTER 3

REPAIR OF CANNON M68

3-1. Removal / Installation

a. Evacuator Chamber. Figure 3-1.

b. Shield From / On Cannon. Figure 3-2.

c. Recoil Mechanism From / On Cannon. Figure 3-3.

d. Cannon Tube. Figure 3-4.

e. Breechblock Group. Refer to TM 9-2350-215-10.

f. Breech Operating Group and Breech Closing Mechanism.

Refer to TM 9-2350-215-20.

3-2. Disassembly / Assembly

a. Breechblock Group. Figure 3-5.

b. Breech Operating Group and Breech Closing Mechanism. Figure 3-5.

c. Breech Mechanism Group and Breech Ring Group. Figure 3-7.

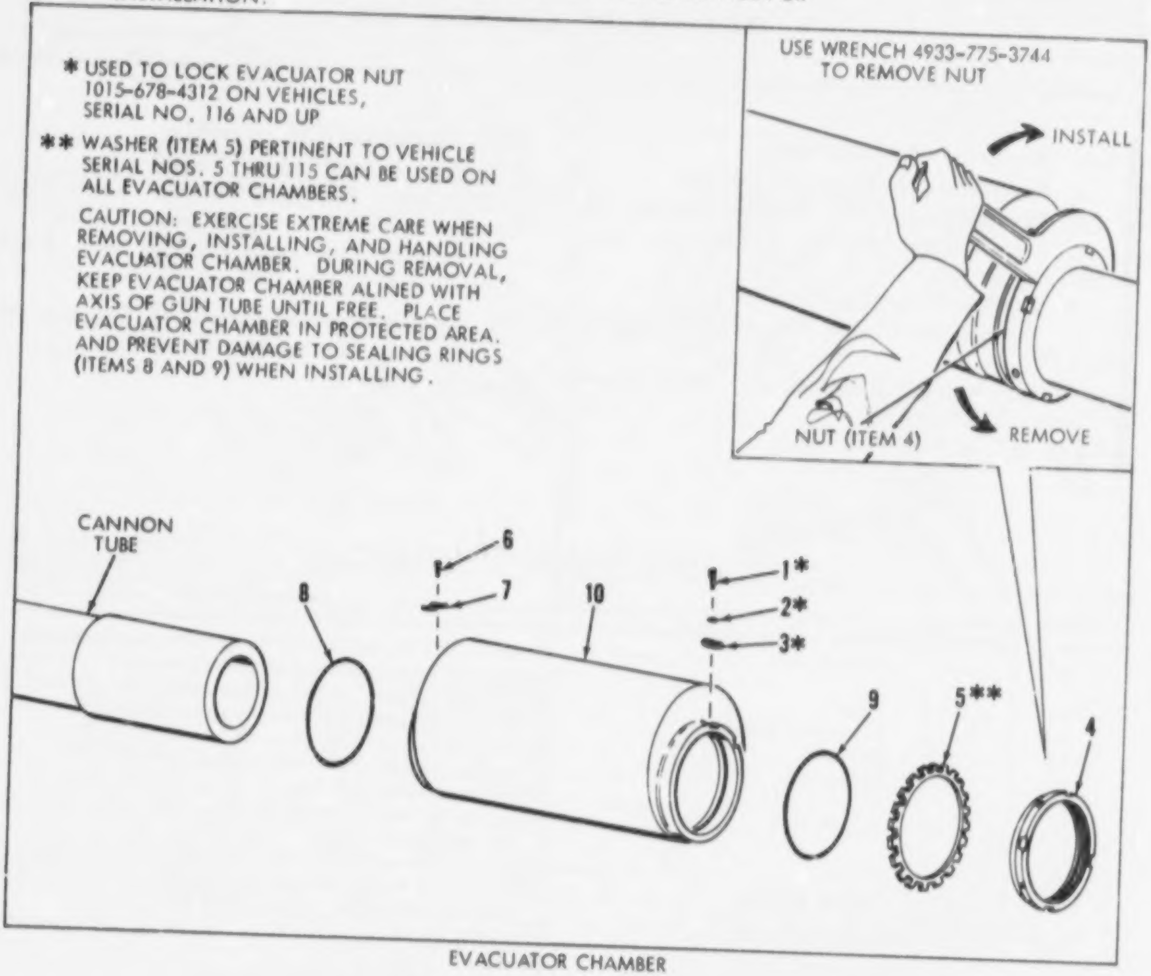
3-3. Inspection and Repair of Cannon and Breech Mechanism Assembly

Refer to table 3.

Table 3. Inspection of Cannon M68

Figure	Item	Component	Serviceability criteria
3-4	7	Cannon tube	Refer to TM 9-1000-202-35 for detailed bore inspection and allowable repair and replacement data.
3-1	8, 9	Ring	Must seal tightly. Replace at assembly.
3-1	10	Evacuator chamber	Free of cracks and holes. Seams must be tight.
3-5	1	Retainer	Ears must not be cracked or broken.
3-5	3	Firing pin	Check continuity. Point not oxidized.
3-5	7	Plate	Must not be cracked, broken, or burred.
3-5	19	Breechblock	Must not be cracked. Must not be worn to extent of functioning improperly.
3-6	2	Crank	Must not be worn to the point that cam action is inoperative.
3-6	3	Lever assembly	Must not be bent or broken. Holes must not be enlarged or have chipped edges.
3-6	14	Crank	Capable of fitting properly to operating and breechblock crank.
3-6	13	Pivot	Not bent, broken, or worn unevenly.
3-6	18	Leaf spring	Must not be distorted, corroded, or broken.
3-7	1, 6	Extractor	Must not be cracked, broken, or burred.
3-7	15	Stop	Must not be cracked or broken.
3-7	22	Collar	Threads must not be mutilated or burred.
3-7	23	Insert	Must not be cracked or broken.
3-7	24	Plunger	Must be straight.
3-7	26	Conductor	Must not be oxidized. Must be intact.
3-7	27	Sleeve	Must not be oxidized. Must be intact.
3-7	46	Closing mechanism	Must not be cracked. Holes must not be worn to extent of preventing proper functioning of operating shaft.
3-7	50	Breech ring body	Must not be cracked. Threads must be clearly defined. Recess must be free of burs and nicks.

NOTE: FOLLOW NUMERIC SEQUENCE FOR REMOVAL. REVERSE SEQUENCE FOR INSTALLATION.



* USED TO LOCK EVACUATOR NUT 1015-678-4312 ON VEHICLES, SERIAL NO. 116 AND UP

** WASHER (ITEM 5) PERTINENT TO VEHICLE SERIAL NOS. 5 THRU 115 CAN BE USED ON ALL EVACUATOR CHAMBERS.

CAUTION: EXERCISE EXTREME CARE WHEN REMOVING, INSTALLING, AND HANDLING EVACUATOR CHAMBER. DURING REMOVAL, KEEP EVACUATOR CHAMBER ALINED WITH AXIS OF GUN TUBE UNTIL FREE. PLACE EVACUATOR CHAMBER IN PROTECTED AREA. AND PREVENT DAMAGE TO SEALING RINGS (ITEMS 8 AND 9) WHEN INSTALLING.

USE WRENCH 4933-775-3744 TO REMOVE NUT

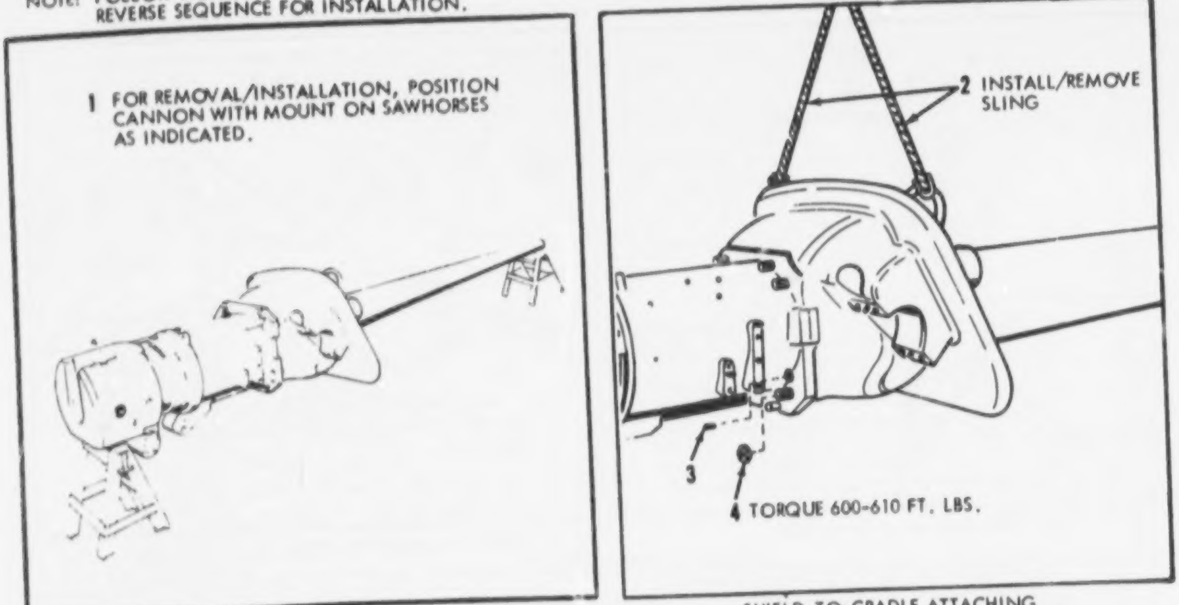
EVACUATOR CHAMBER

1 - SCREW
2 - WASHER
3 - KEY
4 - NUT
5 - WASHER
6 - SCREW
7 - KEY
8 - RING
9 - RING
10 - CHAMBER

WE 9724

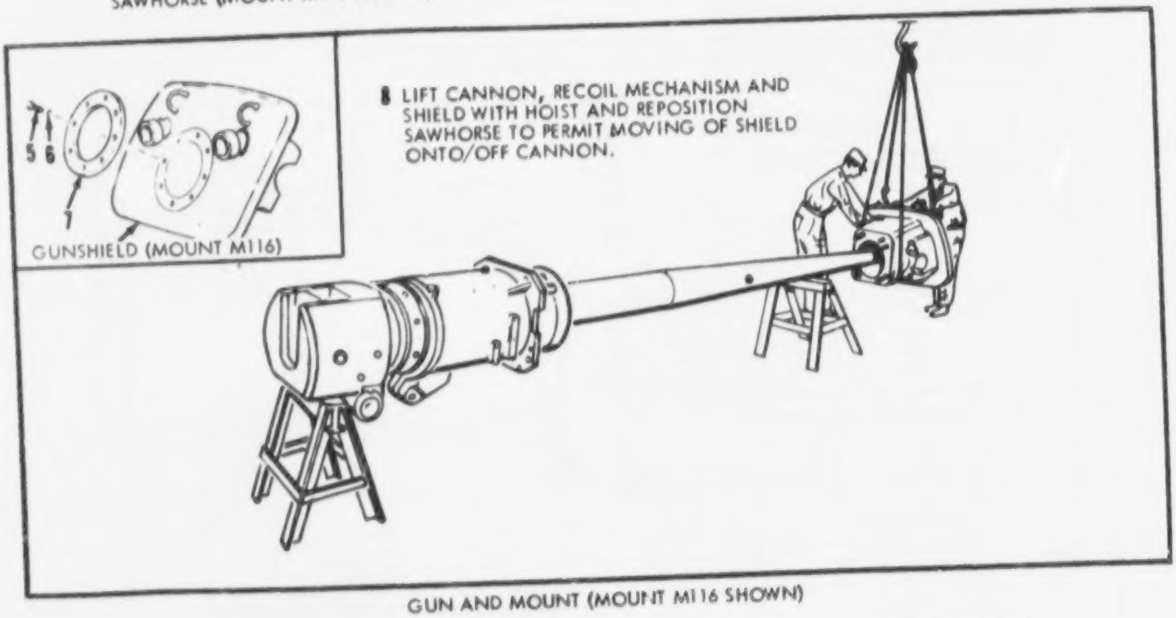
Figure 3-1. Removal / installation of evacuator chamber from / on cannon.

NOTE: FOLLOW NUMERIC SEQUENCE FOR REMOVAL.
REVERSE SEQUENCE FOR INSTALLATION.


1 FOR REMOVAL/INSTALLATION, POSITION CANNON WITH MOUNT ON SAWHORSES AS INDICATED.
2 INSTALL/REMOVE SLING
3
4 TORQUE 600-610 FT. LBS.

POSITION OF GUN AND MOUNT ON SAWHORSE (MOUNT M116 SHOWN)

SHIELD-TO-CRADLE ATTACHING HARDWARE (MOUNT M116 SHOWN)


5
6
7
GUNSHIELD (MOUNT M116)
8 LIFT CANNON, RECOIL MECHANISM AND SHIELD WITH HOIST AND REPOSITION SAWHORSE TO PERMIT MOVING OF SHIELD ONTO/OFF CANNON.

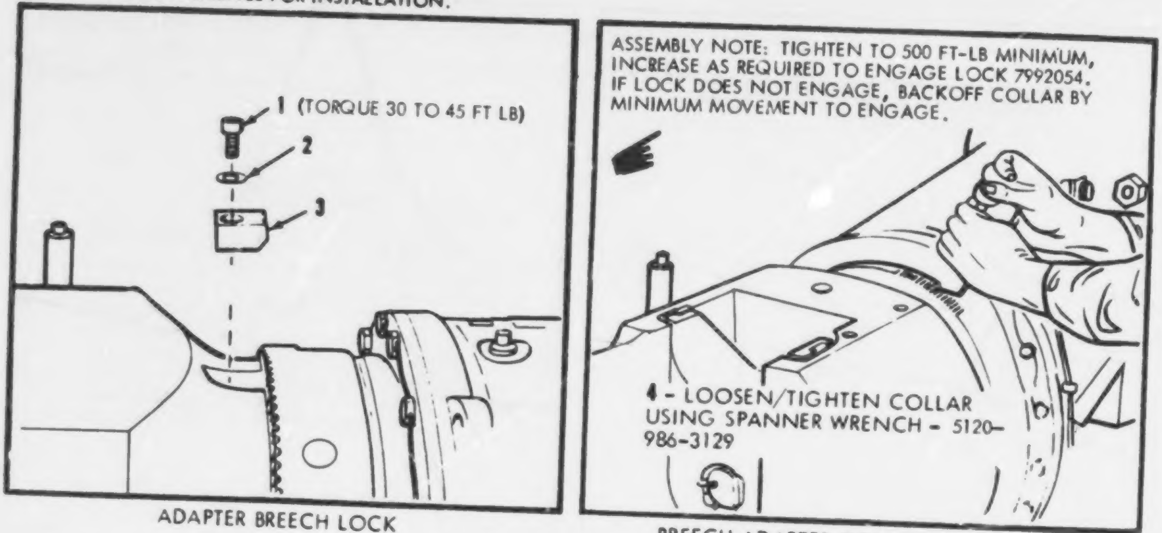
GUN AND MOUNT (MOUNT M116 SHOWN)

3 - PIN 8734047 (2)
4 - NUT MS21044-N18 (8)
5 - SCREW MS90728-115 (8)
6 - WASHER MS35338-67 (8)
7 - SHIELD COVER 10863653

WE 73704

Figure 3-2. Removal/installation of shield from/on cannon.

NOTE: FOLLOW NUMERIC SEQUENCE FOR REMOVAL.
REVERSE SEQUENCE FOR INSTALLATION.



ASSEMBLY NOTE: TIGHTEN TO 500 FT-LB MINIMUM, INCREASE AS REQUIRED TO ENGAGE LOCK 7992054. IF LOCK DOES NOT ENGAGE, BACKOFF COLLAR BY MINIMUM MOVEMENT TO ENGAGE.

4 - LOOSEN/TIGHTEN COLLAR USING SPANNER WRENCH - 5120-986-3129

ADAPTER BREECH LOCK

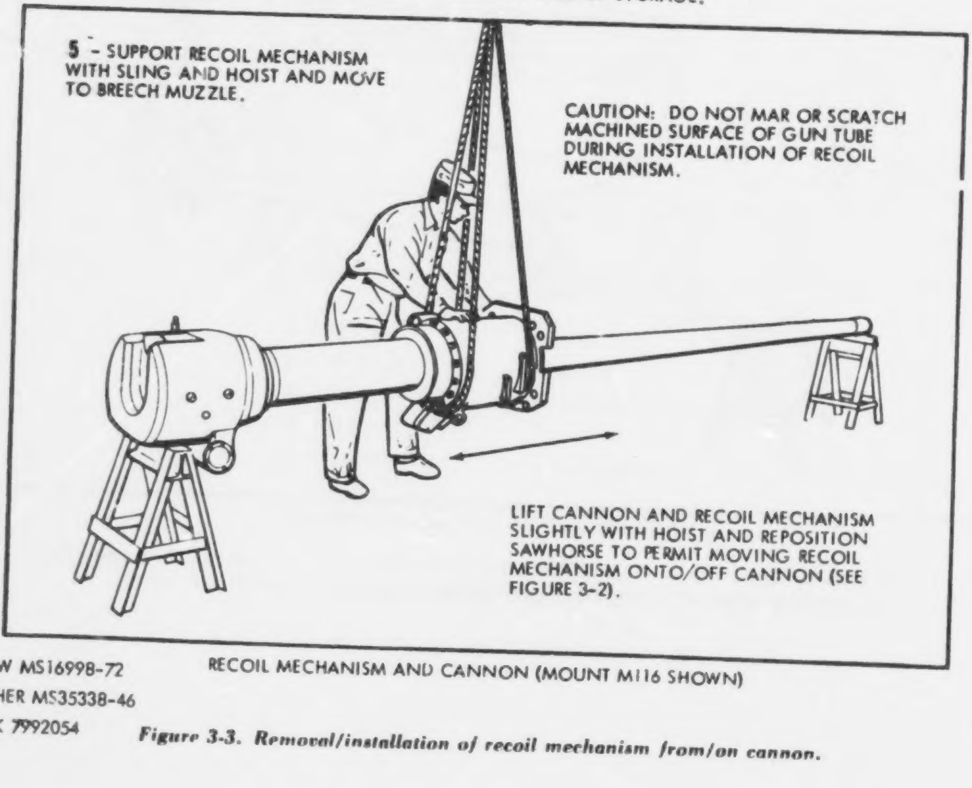
BREECH ADAPTER COLLAR AND BREECH

INSTALLATION NOTES

1. BEFORE INSTALLING RECOIL MECHANISM, REMOVE ANY DIRT, RUST, OR RUST PREVENTIVE COMPOUND FROM MACHINED SURFACES.

2. LUBRICATE UNPAINTED SURFACE OF GUN TUBE AND INNER BEARING SURFACE OF GUN TUBE SUPPORT SLEEVE WITH GAA.

3. DO NOT REMOVE RUST PREVENTIVE COMPOUND FROM GUN BORE IF NEWLY APPLIED OR IF VEHICLE IS GOING DIRECTLY INTO ANY TYPE OF STORAGE.



5 - SUPPORT RECOIL MECHANISM WITH SLING AND HOIST AND MOVE TO BREECH MUZZLE.

CAUTION: DO NOT MAR OR SCRATCH MACHINED SURFACE OF GUN TUBE DURING INSTALLATION OF RECOIL MECHANISM.

LIFT CANNON AND RECOIL MECHANISM SLIGHTLY WITH HOIST AND REPOSITION SAWHORSE TO PERMIT MOVING RECOIL MECHANISM ONTO/OFF CANNON (SEE FIGURE 3-2).

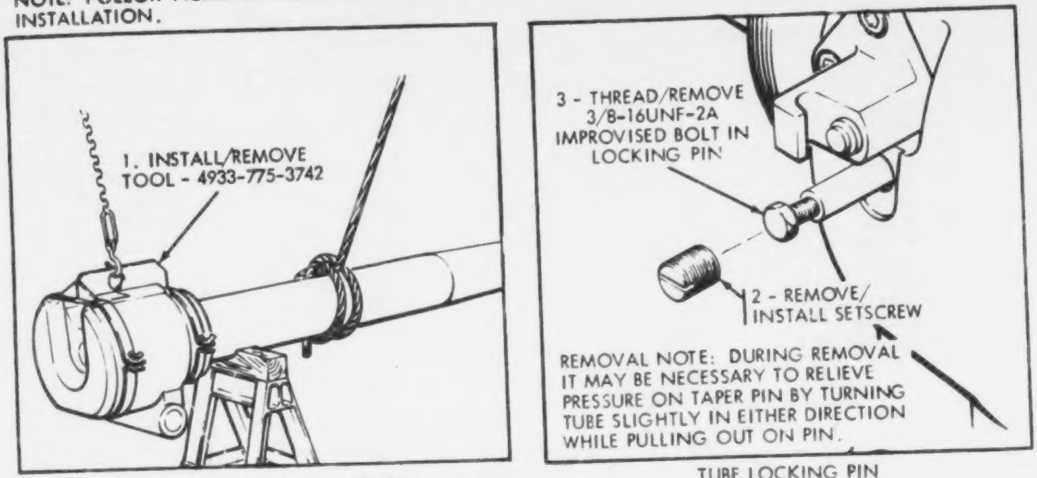
RECOIL MECHANISM AND CANNON (MOUNT M116 SHOWN)

1 - SCREW MS16998-72
2 - WASHER MS35338-46
3 - LOCK 7992054

Figure 3-3. Removal/installation of recoil mechanism from/on cannon.

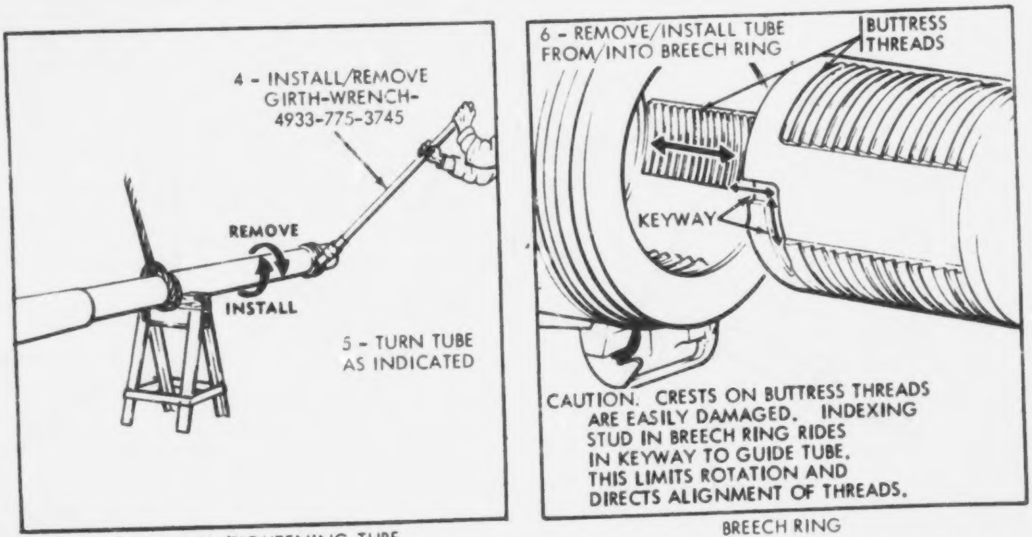
WE 73575

NOTE: FOLLOW NUMERIC SEQUENCE FOR REMOVAL. REVERSE SEQUENCE FOR INSTALLATION.


1. INSTALL/REMOVE
TOOL - 4933-775-3742
3 - THREAD/REMOVE
3/8-16UNF-2A
IMPROVISED BOLT IN
LOCKING PIN
2 - REMOVE/
INSTALL SETSCREW
REMOVAL NOTE: DURING REMOVAL IT MAY BE NECESSARY TO RELIEVE PRESSURE ON TAPER PIN BY TURNING TUBE SLIGHTLY IN EITHER DIRECTION WHILE PULLING OUT ON PIN.

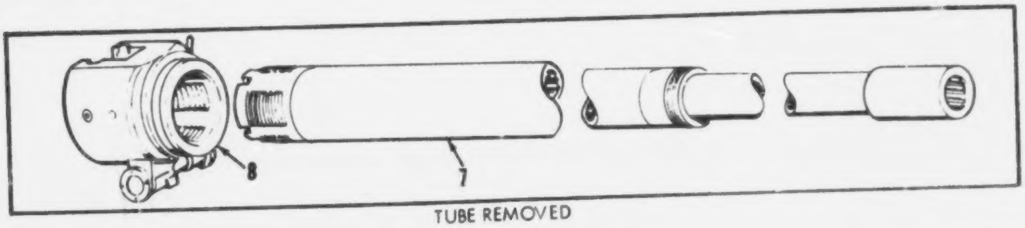
BREECH LIFTING TOOL ASSEMBLY

TUBE LOCKING PIN


4 - INSTALL/REMOVE
GIRTH-WRENCH-
4933-775-3745
REMOVE
INSTALL
5 - TURN TUBE
AS INDICATED
6 - REMOVE/INSTALL TUBE
FROM/INTO BREECH RING
BUTTRESS
THREADS
KEYWAY
CAUTION. CRESTS ON BUTTRESS THREADS ARE EASILY DAMAGED. INDEXING STUD IN BREECH RING RIDES IN KEYWAY TO GUIDE TUBE. THIS LIMITS ROTATION AND DIRECTS ALIGNMENT OF THREADS.

LOOSENING/TIGHTENING TUBE

BREECH RING

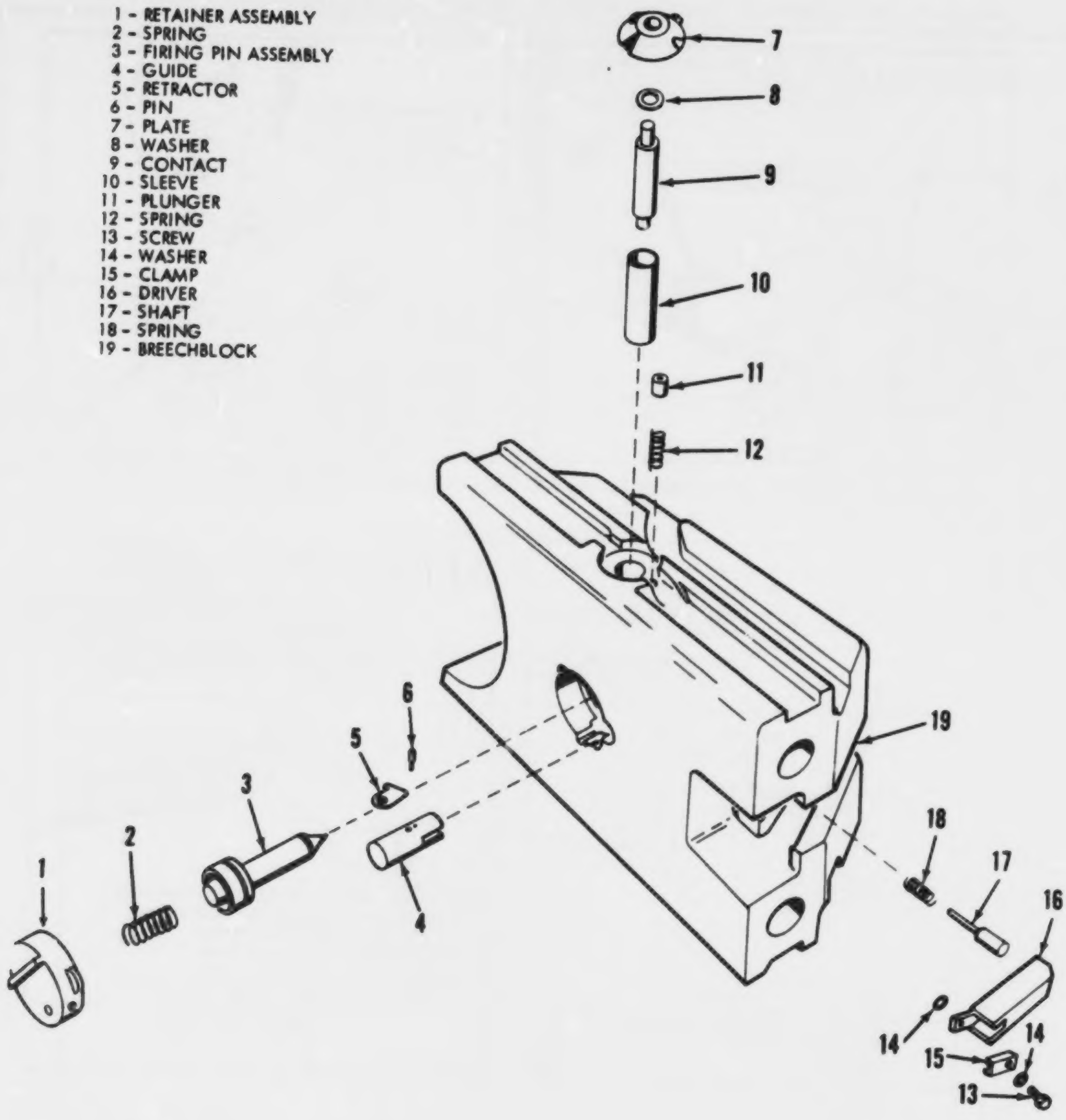


TUBE REMOVED

7 - TUBE
8 - BREECH MECHANISM ASSEMBLY

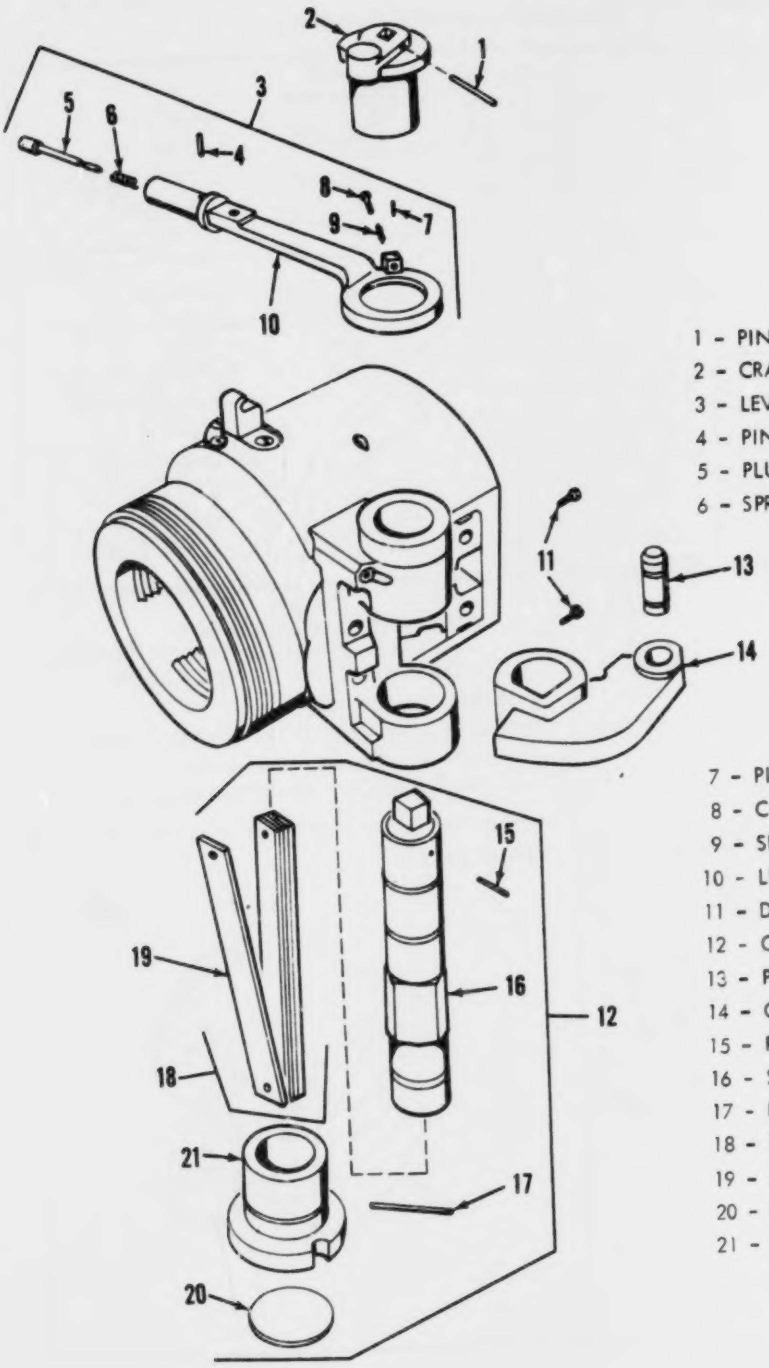
WE 67939

Figure 3-4. Removal / installation of cannon tube.


1 - RETAINER ASSEMBLY
2 - SPRING
3 - FIRING PIN ASSEMBLY
4 - GUIDE
5 - RETRACTOR
6 - PIN
7 - PLATE
8 - WASHER
9 - CONTACT
10 - SLEEVE
11 - PLUNGER
12 - SPRING
13 - SCREW
14 - WASHER
15 - CLAMP
16 - DRIVER
17 - SHAFT
18 - SPRING
19 - BREECHBLOCK
7
8
9
10
11
12
19
6
5
3
2
1
4
18
17
16
14
14
15
13

WE 67940

Figure 3-5. Breechblock group—exploded view.

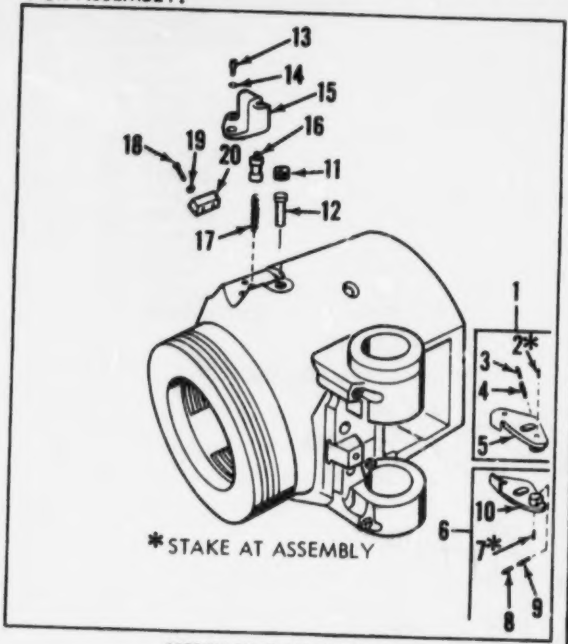

2
1
3
5
6
4
8
7
9
10
11
13
14
15
19
16
12
18
21
17
20

1 - PIN
2 - CRANK
3 - LEVER ASSEMBLY
4 - PIN
5 - PLUNGER
6 - SPRING
7 - PIN
8 - CLUTCH
9 - SPRING
10 - LEVER
11 - DETENT
12 - CLOSING MECHANISM
13 - PIVOT
14 - CRANK
15 - PIN
16 - SHAFT
17 - PIN
18 - SPRING ASSEMBLY
19 - SPRING (24)
20 - PLUG
21 - ADJUSTER

WE 9728

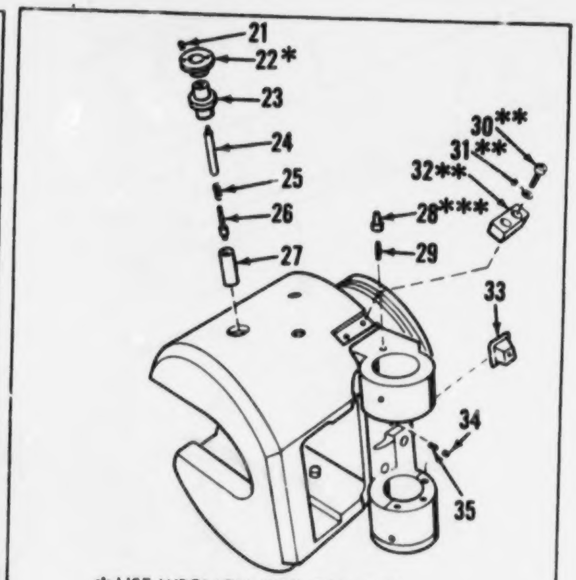
Figure 3-6. Breech operating group and breech closing mechanism—exploded view.

NOTE: FOLLOW NUMERICAL SEQUENCE FOR DISASSEMBLY. REVERSE SEQUENCE FOR ASSEMBLY.


13
14
15
16
18
19
20
11
12
17
1
2*
3
4
5
10
6
7*
8
9

*STAKE AT ASSEMBLY

BREECH RING MECHANISM

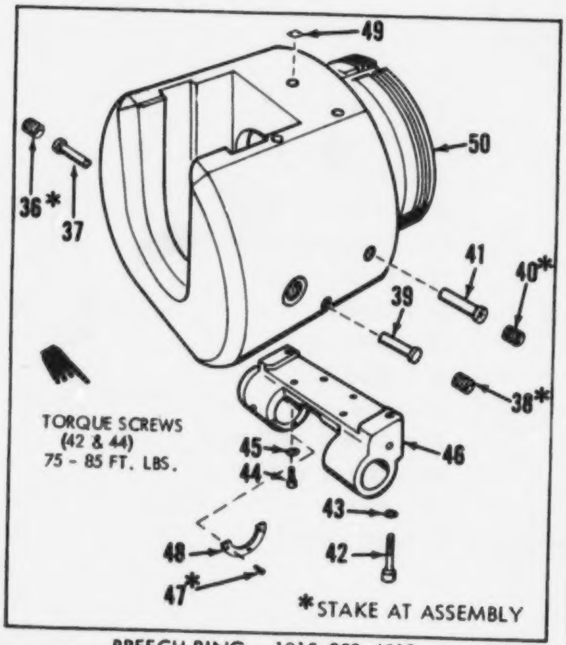

21
22*
23
24
25
26
27
30**
31**
32**
28***
29
33
34
35

*USE WRENCH 4933-740-0477 TO REMOVE/INSTALL ITEM 22. REFER TO TM 9-2350-215-20 FOR PROCEDURE.

**MOUNT M140 ONLY

***AT ASSEMBLY, STAKE 12 AND 3 O'CLOCK

BREECH MECHANISM COMPONENTS

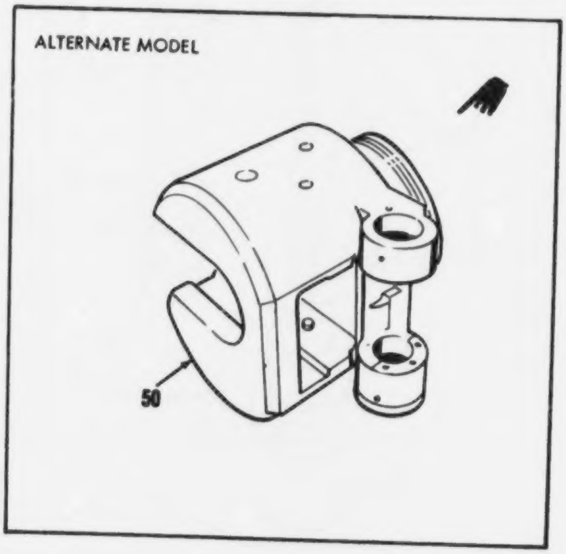

49
50
36*
37
41
40*
39
38*
45
44
46
43
42
48
47*

TORQUE SCREWS (42 & 44) 75 - 85 FT. LBS.

*STAKE AT ASSEMBLY

BREECH RING - 1015-859-4512

ALTERNATE MODEL



WE 67941

Figure 3-7. Disassembly / assembly of breech mechanism and breech ring group.

LEGEND to fig. 3-7:

1—Extractor
2—Pin
3—Plunger
4—Spring
5—Body
6—Extractor
7—Pin
8—Plunger
9—Spring
10—Body
11—Setscrew
12—Pin
13—Screw (2)
14—Washer (2)
15—Stop
16—Plunger
17—Spring
18—Screw (2)
19—Washer (2)
20—Key
21—Setscrew
22—Collar
23—Insert
24—Plunger
25—Spring
26—Conductor
27—Sleeve
28—Plunger
29—Spring
30—Screw (2)
31—Washer (2)
32—Key
33—Stop
34—Pin
35—Spring
36—Setscrew
37—Pivot
38—Setscrew
39—Pivot
40—Setscrew
41—Stud
42—Screw (2)
43—Washer (2)
44—Screw (4)
45—Washer (4)
46—Bracket
47—Screw (3)
48—Rest
49—Plate (3)
50—Body

Figure 3-7—Continued.

CHAPTER 4

REPAIR OF MOUNTS M116 AND M140

Section I. TESTING OF ELEVATION MECHANISM ASSEMBLY

4-1. Removal/Installation of Elevating Mechanism Assembly

Refer to figure 4-1.

Note. When gun mount with cannon is removed from tank, elevating mechanism is detached from mount and remains in vehicle until testing and repair is initiated (fig. 2-7).

4-2. Testing

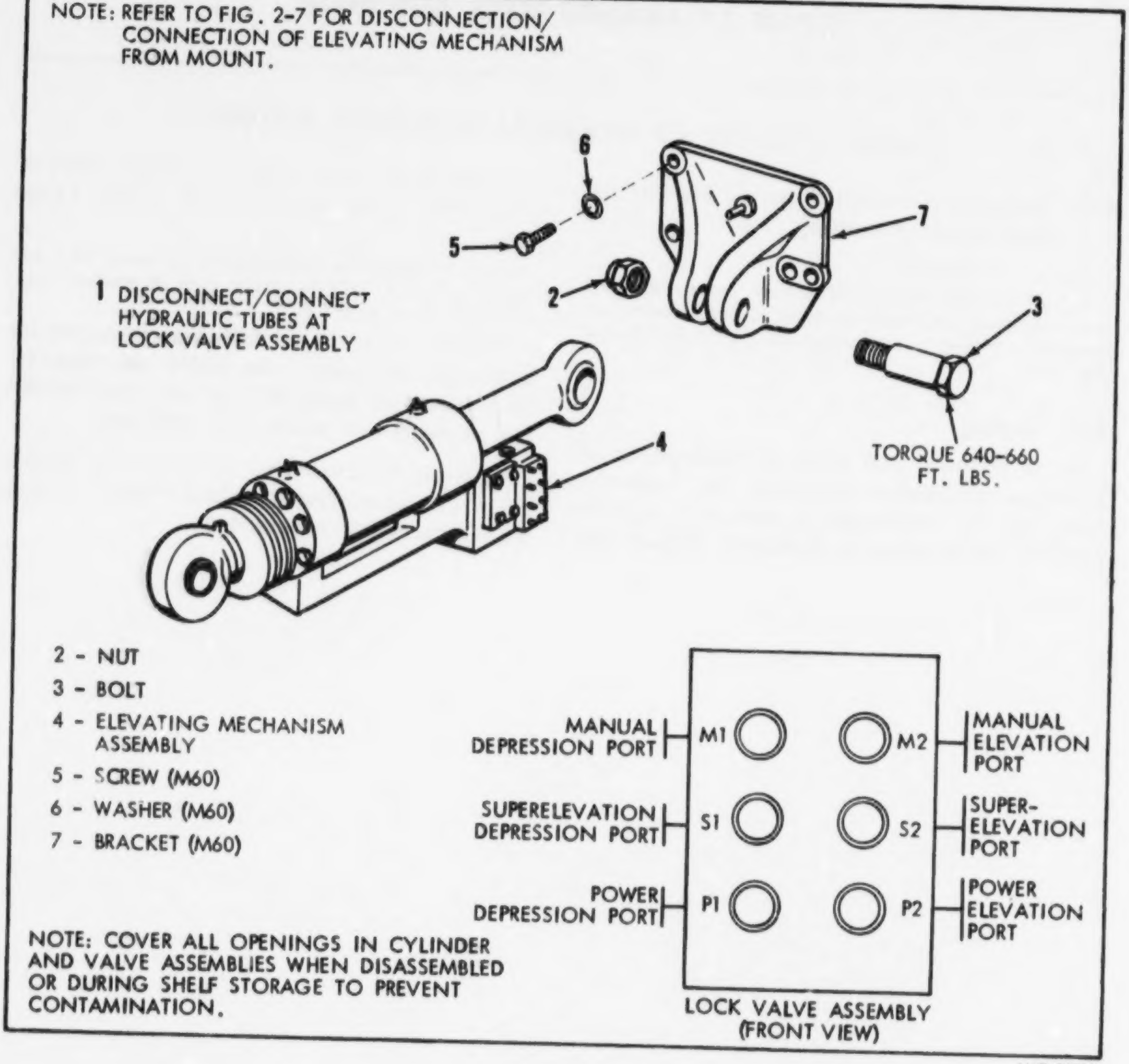
After removal and prior to disassembly of elevating mechanism assembly, the following tests will be performed to determine specific area of malfunction or deficiency. Repair will be performed upon failure to meet performance tests. After completion of repair, repeat tests.

Note. Performance requirements of these tests are based on use of OHT hydraulic fluid at ambient temperatures of 70° to 80° F.

Caution: **Some of the following tests require hydraulic oil pump with 10,000 psi capacity. Do not use oil pump M3 for any tests involving pressures of more than 5,000 psi.**

a. High Pressure Test of Elevating Mechanism. (Depot maintenance only) Refer to table 4 and figures 4-2 through 4-4.

NOTE: FOLLOW NUMERIC SEQUENCE FOR DISASSEMBLY REVERSE SEQUENCE FOR ASSEMBLY.



NOTE: REFER TO FIG. 2-7 FOR DISCONNECTION/CONNECTION OF ELEVATING MECHANISM FROM MOUNT.

1 DISCONNECT/CONNECT HYDRAULIC TUBES AT LOCK VALVE ASSEMBLY

TORQUE 640-660 FT. LBS.

2 - NUT
3 - BOLT
4 - ELEVATING MECHANISM ASSEMBLY
5 - SCREW (M60)
6 - WASHER (M60)
7 - BRACKET (M60)

NOTE: COVER ALL OPENINGS IN CYLINDER AND VALVE ASSEMBLIES WHEN DISASSEMBLED OR DURING SHELF STORAGE TO PREVENT CONTAMINATION.

6
5
7
2
3
4
MANUAL DEPRESSION PORT
M1
M2
MANUAL ELEVATION PORT
SUPERELEVATION DEPRESSION PORT
S1
S2
SUPER-ELEVATION PORT
POWER DEPRESSION PORT
P1
P2
POWER ELEVATION PORT
LOCK VALVE ASSEMBLY (FRONT VIEW)

WE 9731

Figure 4-1. Removal/installation of elevating mechanism assembly.

Table 4. High Pressure Test

Requirement	Pressure		Block Ports	Leakage or Flow Per Port		Remarks
No.	P.S.I.	Apply at		Max. or Min.	Check at	
9 (See figs. 4–2, 4–3, and 4–4)	8,000 to 10,000	port A	M_1 M_2 S_1 S_2 P_1 P_2 and B	No external leakage will be permitted.	(See figs 4–2, 4–3, and 4–4)	Pressure is to be maintained for a minimum of three minutes. Piston movement will be disregarded.
		port B	M_1 M_2 S_1 S_2 P_1 P_2 and A			

b. Relief Valve Opening Test. (Depot Maintenance Only) Refer to table 5 and figures 4–5 and 4–6.

Table 5. Relief Valve Opening Test

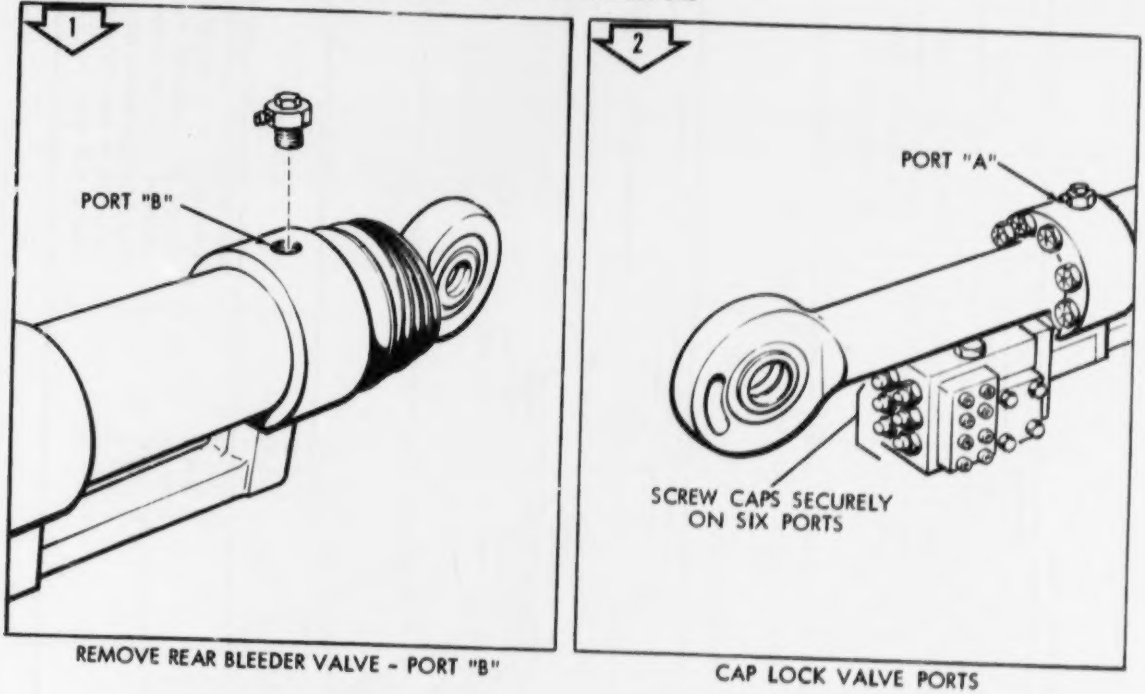
Requirement	Pressure		Block Ports	Leakage or Flow Per Port		Remarks
No.	P.S.I.	Apply at		Max. or Min.	Check at	
2 (See figs. 4–5 and 4–6)	7,000 to 8,000	port A	M_1 M_2 S_1 S_2 P_1 and P_2	Flow to be evident	port B	Piston rod to be fully extended when pressure is applied at port A, and fully retracted when pressure is applied at port B.
		port B Pressure required to initiate flow shall not be less than 7,000 psi or in excess of 8,000 psi.	M_1 M_2 S_1 S_2 P_1 and P_2	Flow to be evident	port A (See figs. 4–5 and 4–6)	

c. Piston Movement Travel Test. Refer to table 6 and figure 4–7.

Table 6. Piston Movement Travel Test

Requirement	Pressure		Block Ports	Remarks
No.	P.S.I.	Apply at		
3 (See fig. 4–7)	10 max.	port A	M_1 M_2 S_1 S_2 P_1 and P_2 (optional)	Piston rod to be fully retracted when pressure is applied at port A, and fully extended when pressure is applied at port B, piston rod movement must be a minimum of eight (8) inches during this test.
		port B	M_1 M_2 S_1 S_2 P_1 and P_2 (optional)	

NOTE: FOLLOW NUMERIC SEQUENCE FOR TESTING PROCEDURE


1
PORT "B"
2
PORT "A"
SCREW CAPS SECURELY ON SIX PORTS

REMOVE REAR BLEEDER VALVE - PORT "B"

CAP LOCK VALVE PORTS

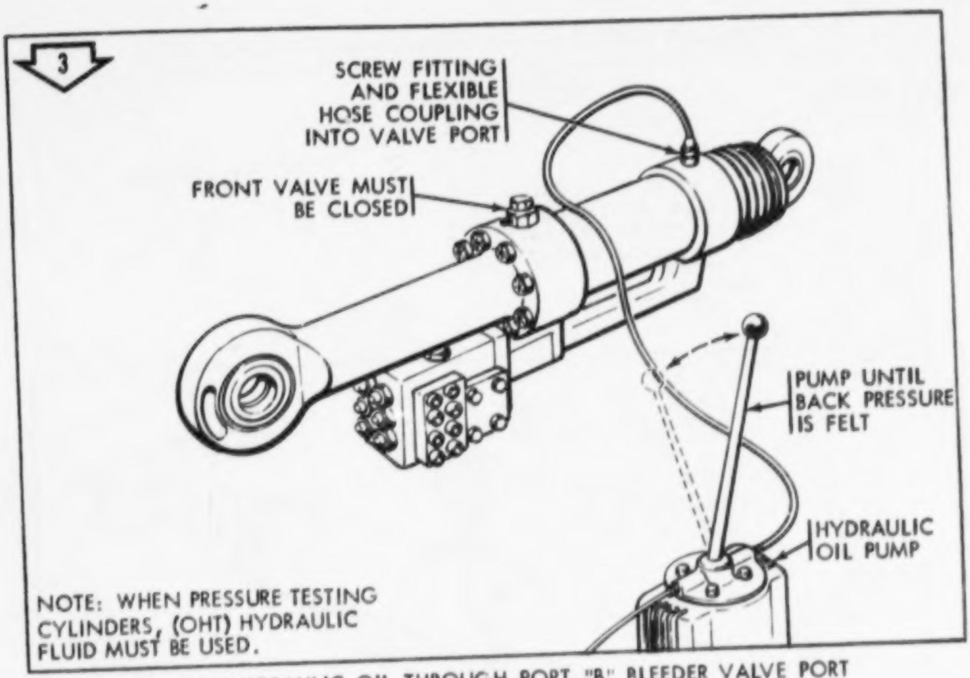
WE 12693

Figure 4-2. High pressure testing of elevating mechanism assembly (1 of 3).

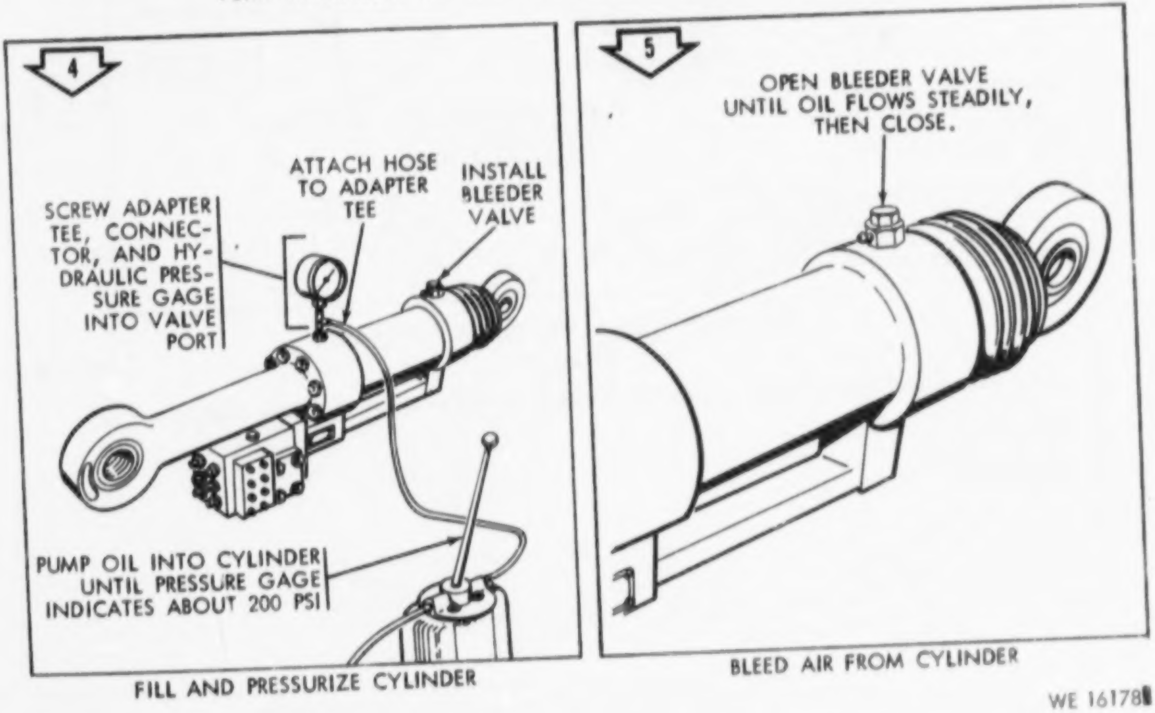
d. *Lock Valve By-Pass Test.* Refer to figure 4-8.

e. *Lock Valve Opening Test.* Refer to figure 4-9.

f. *Piston Holding Test.* Refer to figures 4-10 and 4-11.


3
SCREW FITTING AND FLEXIBLE HOSE COUPLING INTO VALVE PORT
FRONT VALVE MUST BE CLOSED
PUMP UNTIL BACK PRESSURE IS FELT
HYDRAULIC OIL PUMP
NOTE: WHEN PRESSURE TESTING CYLINDERS, (OHT) HYDRAULIC FLUID MUST BE USED.

PUMP HYDRAULIC OIL THROUGH PORT "B" BLEEDER VALVE PORT

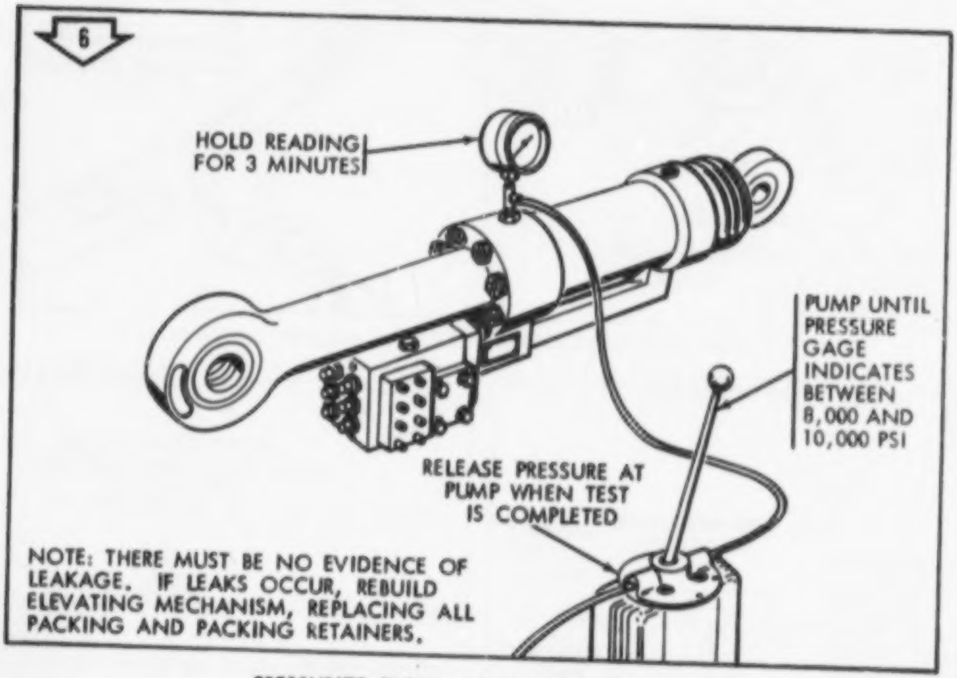

4
ATTACH HOSE TO ADAPTER TEE
INSTALL BLEEDER VALVE
SCREW ADAPTER TEE, CONNECTOR, AND HYDRAULIC PRESSURE GAGE INTO VALVE PORT
PUMP OIL INTO CYLINDER UNTIL PRESSURE GAGE INDICATES ABOUT 200 PSI
5
OPEN BLEEDER VALVE UNTIL OIL FLOWS STEADILY, THEN CLOSE.

FILL AND PRESSURIZE CYLINDER

BLEED AIR FROM CYLINDER

WE 16178

Figure 4-3. High pressure testing of elevating mechanism assembly (2 of 3).


6
HOLD READING FOR 3 MINUTES
PUMP UNTIL PRESSURE GAGE INDICATES BETWEEN 8,000 AND 10,000 PSI
RELEASE PRESSURE AT PUMP WHEN TEST IS COMPLETED

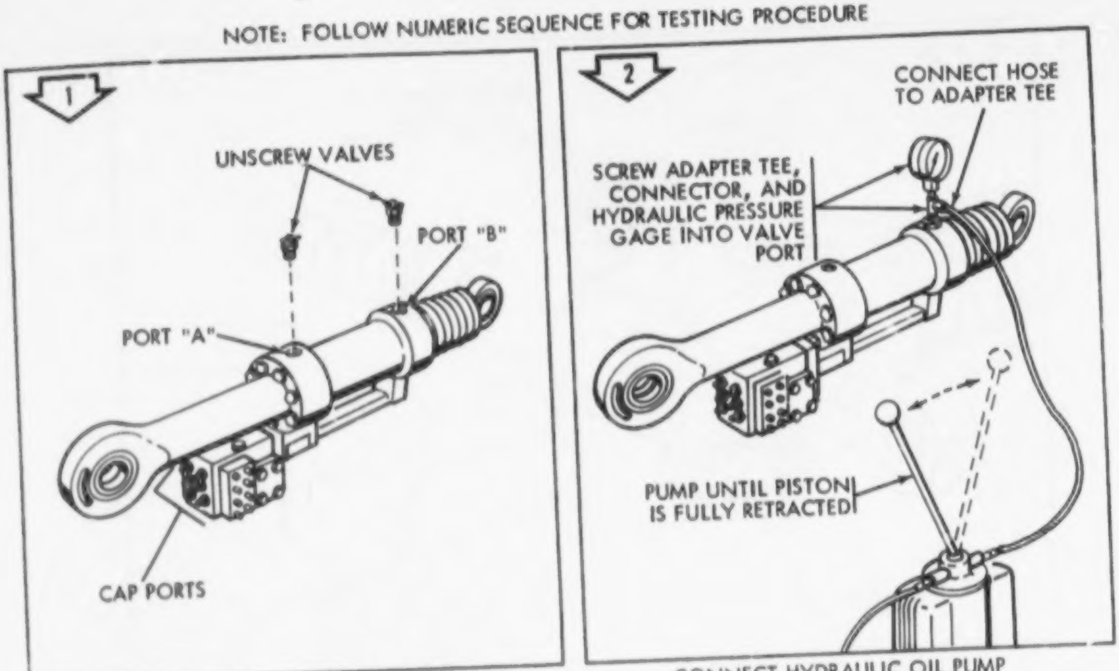
NOTE: THERE MUST BE NO EVIDENCE OF LEAKAGE. IF LEAKS OCCUR, REBUILD ELEVATING MECHANISM, REPLACING ALL PACKING AND PACKING RETAINERS.

PRESSURIZE SYSTEM AND CHECK FOR LEAKS

WE 9734

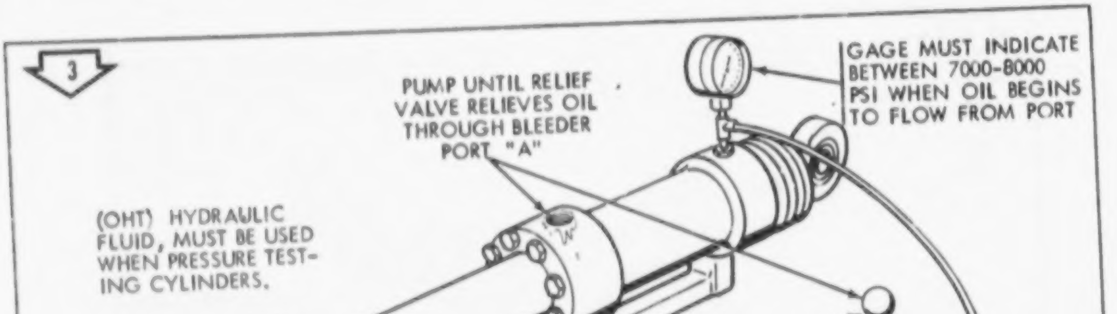
Figure 4-4. High pressure testing of elevating mechanism assembly (sheet 2 of 2).

NOTE: FOLLOW NUMERIC SEQUENCE FOR TESTING PROCEDURE


1
UNSCREW VALVES
PORT "B"
PORT "A"
CAP PORTS
2
CONNECT HOSE TO ADAPTER TEE
SCREW ADAPTER TEE, CONNECTOR, AND HYDRAULIC PRESSURE GAGE INTO VALVE PORT
PUMP UNTIL PISTON IS FULLY RETRACTED

REMOVE BLEEDER VALVES

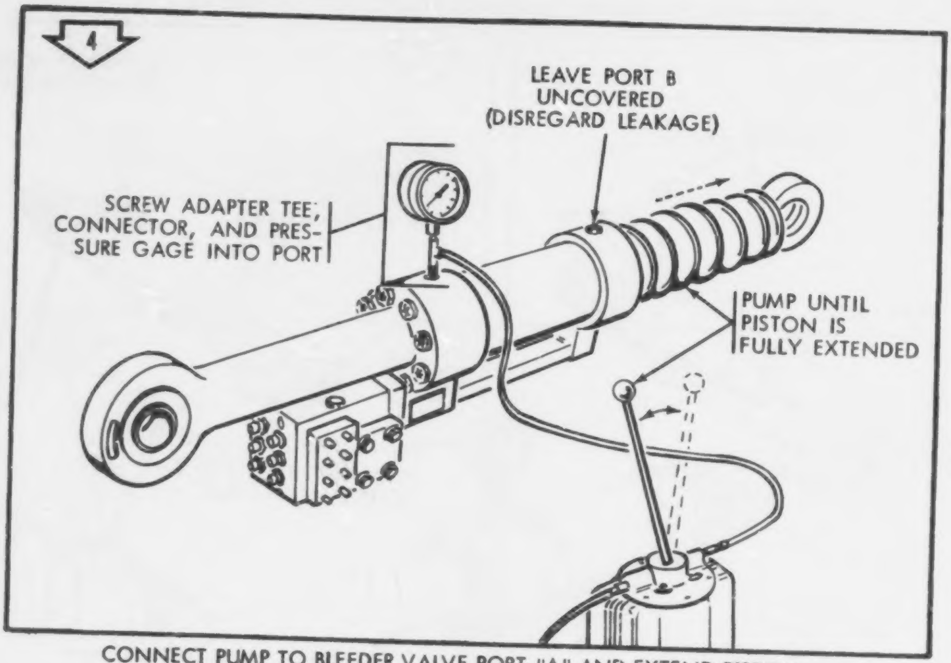
CONNECT HYDRAULIC OIL PUMP AND RETRACT PISTON


3
PUMP UNTIL RELIEF VALVE RELIEVES OIL THROUGH BLEEDER PORT "A"
GAGE MUST INDICATE BETWEEN 7000-8000 PSI WHEN OIL BEGINS TO FLOW FROM PORT
(OHT) HYDRAULIC FLUID, MUST BE USED WHEN PRESSURE TESTING CYLINDERS.
RELEASE PRESSURE AT PUMP WHEN CHECK IS COMPLETED
IF OIL FLOWS BELOW 7000 PSI, ADD WASHERS - 5310-595-8891 TO SHIM UPPER RELIEF VALVE GUIDE AS NECESSARY. IF FLOW OCCURS ABOVE 8000 PSI, REMOVE WASHERS.

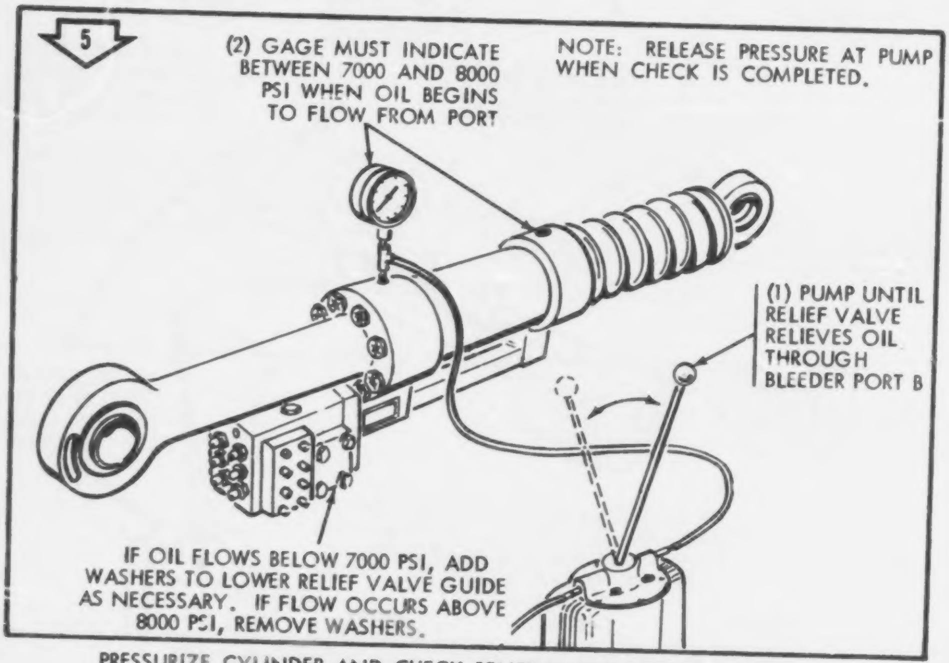
PRESSURIZE CYLINDER AND CHECK VALVE OPENING PRESSURE

WE 9735

Figure 4-5. Relief valve opening test (1 of 2)


4
LEAVE PORT B UNCOVERED (DISREGARD LEAKAGE)
SCREW ADAPTER TEE, CONNECTOR, AND PRESSURE GAGE INTO PORT
PUMP UNTIL PISTON IS FULLY EXTENDED

CONNECT PUMP TO BLEEDER VALVE PORT "A" AND EXTEND PISTON

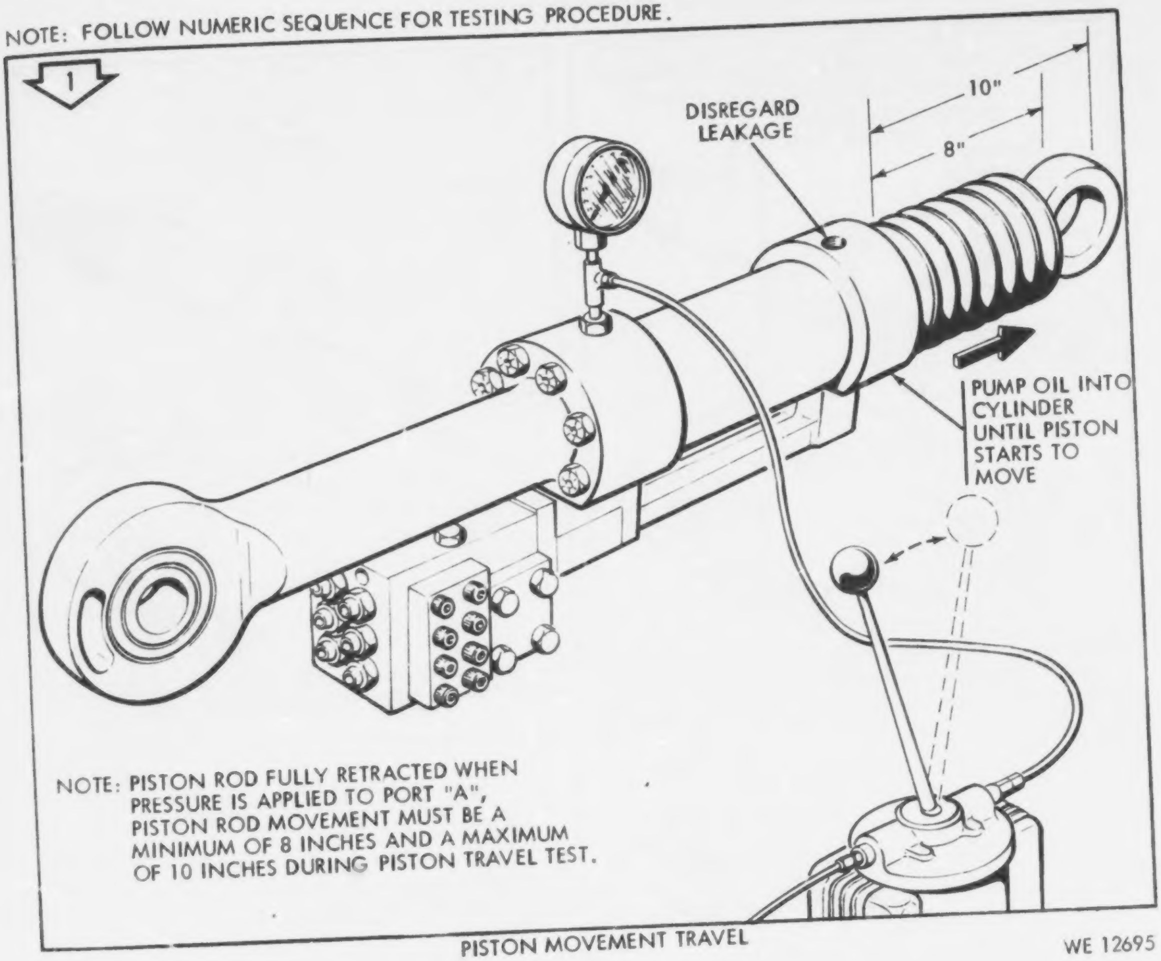

5
(2) GAGE MUST INDICATE BETWEEN 7000 AND 8000 PSI WHEN OIL BEGINS TO FLOW FROM PORT
NOTE: RELEASE PRESSURE AT PUMP WHEN CHECK IS COMPLETED.
(1) PUMP UNTIL RELIEF VALVE RELIEVES OIL THROUGH BLEEDER PORT B
IF OIL FLOWS BELOW 7000 PSI, ADD WASHERS TO LOWER RELIEF VALVE GUIDE AS NECESSARY. IF FLOW OCCURS ABOVE 8000 PSI, REMOVE WASHERS.

PRESSURIZE CYLINDER AND CHECK RELIEF VALVE OPENING PRESSURE

WE 12694

Figure 4-6. Relief valve opening test (2 of 2).

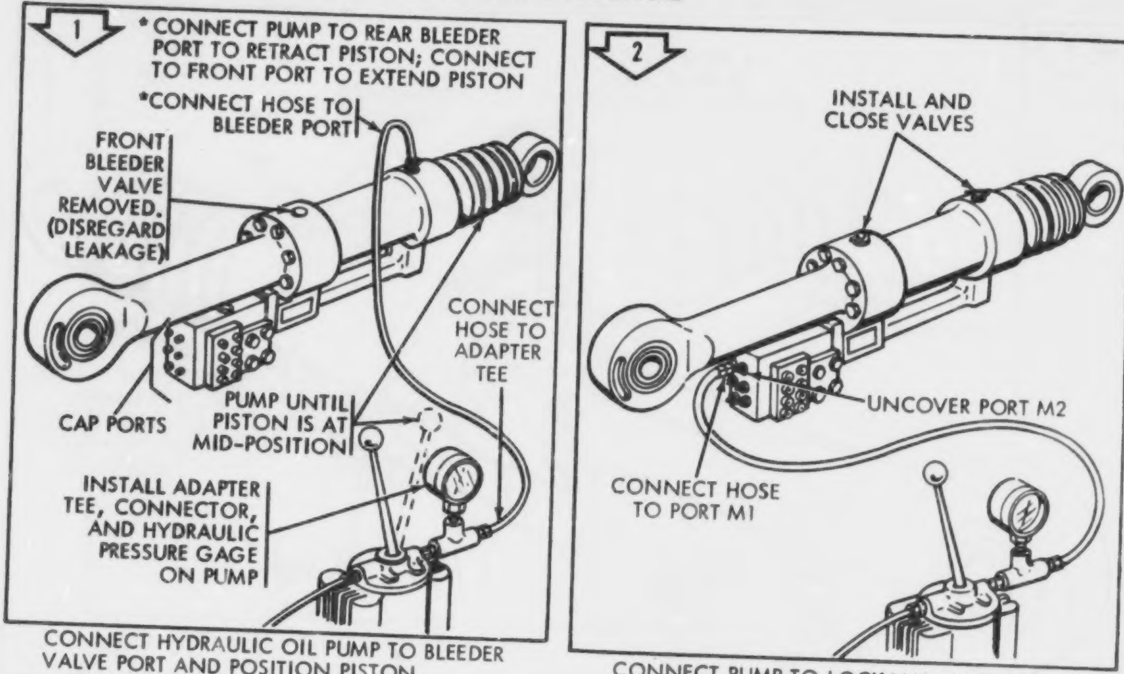
NOTE: FOLLOW NUMERIC SEQUENCE FOR TESTING PROCEDURE.


1
DISREGARD LEAKAGE
10"
8"
PUMP OIL INTO CYLINDER UNTIL PISTON STARTS TO MOVE
PISTON MOVEMENT TRAVEL
WE 12695

NOTE: PISTON ROD FULLY RETRACTED WHEN PRESSURE IS APPLIED TO PORT "A", PISTON ROD MOVEMENT MUST BE A MINIMUM OF 8 INCHES AND A MAXIMUM OF 10 INCHES DURING PISTON TRAVEL TEST.

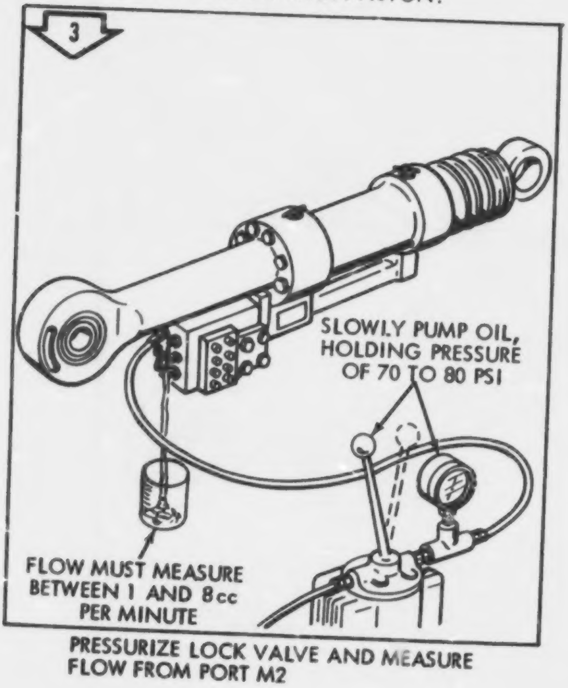
Figure 4-7. Piston movement travel test.

NOTE: FOLLOW NUMERIC SEQUENCE FOR TESTING PROCEDURE


1
*CONNECT PUMP TO REAR BLEEDER PORT TO RETRACT PISTON; CONNECT TO FRONT PORT TO EXTEND PISTON
*CONNECT HOSE TO BLEEDER PORT
FRONT BLEEDER VALVE REMOVED. (DISREGARD LEAKAGE)
CONNECT HOSE TO ADAPTER TEE
CAP PORTS
PUMP UNTIL PISTON IS AT MID-POSITION
INSTALL ADAPTER TEE, CONNECTOR, AND HYDRAULIC PRESSURE GAGE ON PUMP
2
INSTALL AND CLOSE VALVES
UNCOVER PORT M2
CONNECT HOSE TO PORT M1

CONNECT HYDRAULIC OIL PUMP TO BLEEDER VALVE PORT AND POSITION PISTON.

CONNECT PUMP TO LOCK VALVE PORT M1


3
SLOWLY PUMP OIL, HOLDING PRESSURE OF 70 TO 80 PSI
FLOW MUST MEASURE BETWEEN 1 AND 8cc PER MINUTE

PRESSURIZE LOCK VALVE AND MEASURE FLOW FROM PORT M2

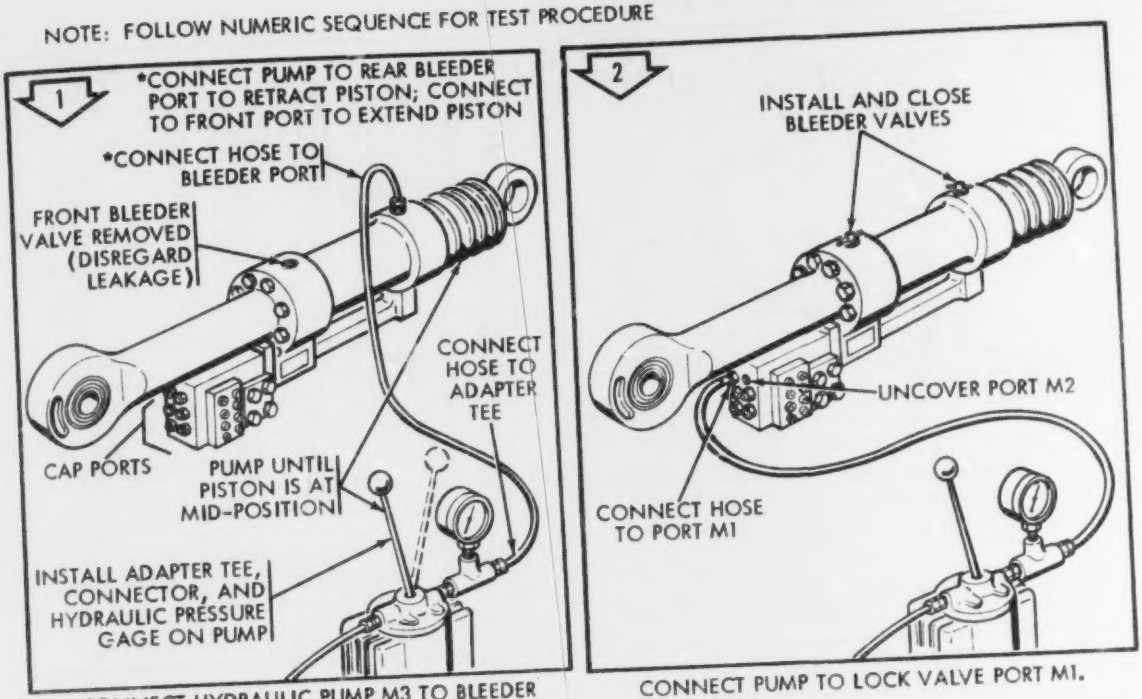
NOTE: WHEN PRESSURE TESTING CYLINDERS, (OHT) HYDRAULIC FLUID MUST BE USED.

REPEAT STEPS 2 AND 3, CONNECTING PUMP TO PORT M2 AND LEAVING M1 UNCOVERED. THEN, REPEAT USING PORTS S1, S2 AND P1, P2 IN TURN. CAP PORTS NOT INVOLVED. FLOW MUST MEASURE BETWEEN 1 AND 8cc IN EACH CASE.

WE 9738

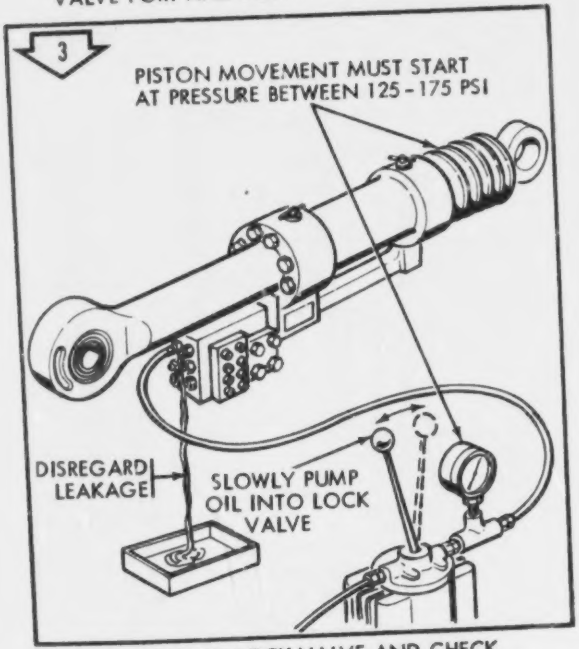
Figure 4-8. Lock valve by-pass test.

NOTE: FOLLOW NUMERIC SEQUENCE FOR TEST PROCEDURE


1
*CONNECT PUMP TO REAR BLEEDER PORT TO RETRACT PISTON; CONNECT TO FRONT PORT TO EXTEND PISTON
*CONNECT HOSE TO BLEEDER PORT
FRONT BLEEDER VALVE REMOVED (DISREGARD LEAKAGE)
CONNECT HOSE TO ADAPTER TEE
CAP PORTS
PUMP UNTIL PISTON IS AT MID-POSITION
INSTALL ADAPTER TEE, CONNECTOR, AND HYDRAULIC PRESSURE GAGE ON PUMP
2
INSTALL AND CLOSE BLEEDER VALVES
UNCOVER PORT M2
CONNECT HOSE TO PORT M1

CONNECT HYDRAULIC PUMP M3 TO BLEEDER VALVE PORT AND POSITION PISTON.

CONNECT PUMP TO LOCK VALVE PORT M1.


3
PISTON MOVEMENT MUST START AT PRESSURE BETWEEN 125 - 175 PSI
DISREGARD LEAKAGE
SLOWLY PUMP OIL INTO LOCK VALVE

PRESSURIZE LOCK VALVE AND CHECK PISTON MOVEMENT.

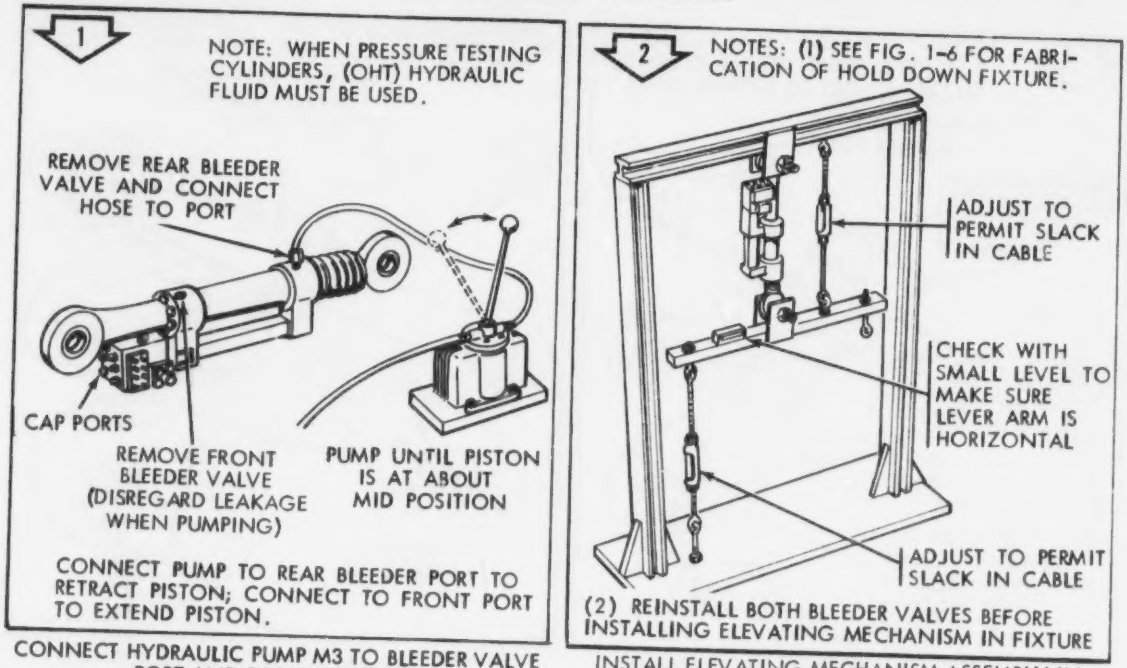
NOTE: WHEN PRESSURE TESTING CYLINDERS, (OHT) HYDRAULIC FLUID MUST BE USED.

REPEAT STEPS 1, 2, AND 3 CONNECTING PUMP TO PORT M2 AND LEAVING M1 UNCOVERED. THEN REPEAT, USING PORTS S1, S2 AND P1, P2 IN TURN. CAP PORTS NOT INVOLVED. PISTON MUST START TO MOVE AT PRESSURE OF 125 TO 175 PSI IN EACH CASE. (WITH HOSE CONNECTED TO M2, S2, AND P2, PISTON WILL RETRACT.)

WE 9739

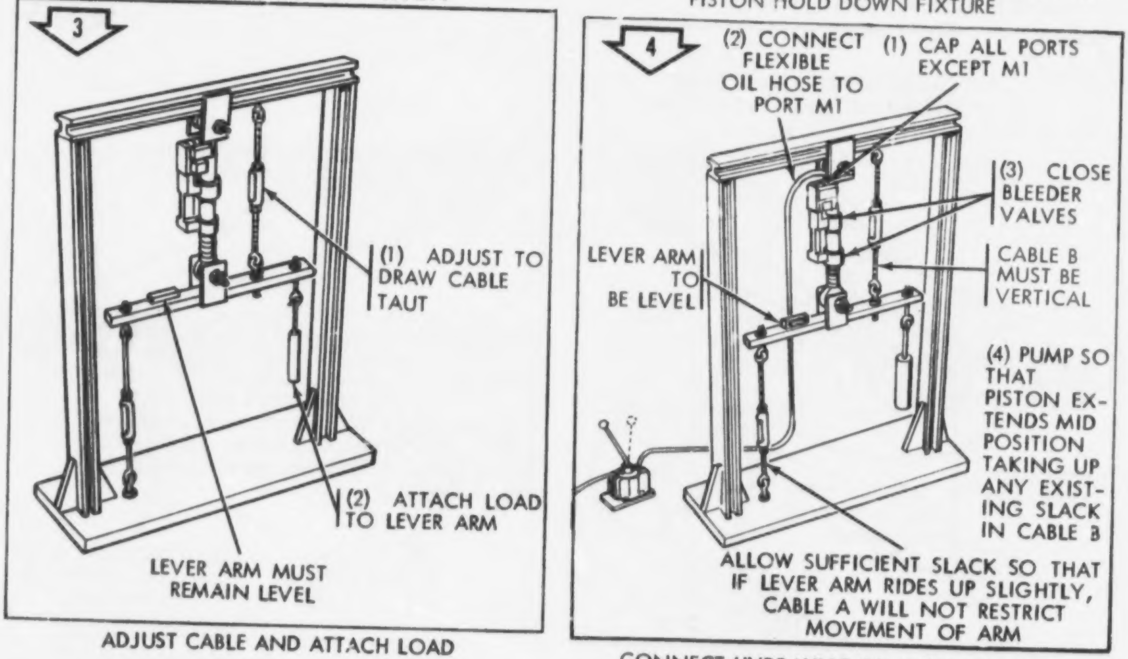
Figure 4–9. Lock valve opening test.

NOTE: FOLLOW NUMERIC SEQUENCE FOR TESTING PROCEDURES.


1
NOTE: WHEN PRESSURE TESTING CYLINDERS, (OHT) HYDRAULIC FLUID MUST BE USED.
REMOVE REAR BLEEDER VALVE AND CONNECT HOSE TO PORT
CAP PORTS
REMOVE FRONT BLEEDER VALVE (DISREGARD LEAKAGE WHEN PUMPING)
PUMP UNTIL PISTON IS AT ABOUT MID POSITION
CONNECT PUMP TO REAR BLEEDER PORT TO RETRACT PISTON; CONNECT TO FRONT PORT TO EXTEND PISTON.
2
NOTES: (1) SEE FIG. 1-6 FOR FABRICATION OF HOLD DOWN FIXTURE.
ADJUST TO PERMIT SLACK IN CABLE
CHECK WITH SMALL LEVEL TO MAKE SURE LEVER ARM IS HORIZONTAL
ADJUST TO PERMIT SLACK IN CABLE
(2) REINSTALL BOTH BLEEDER VALVES BEFORE INSTALLING ELEVATING MECHANISM IN FIXTURE

CONNECT HYDRAULIC PUMP M3 TO BLEEDER VALVE PORT AND POSITION PISTON

INSTALL ELEVATING MECHANISM ASSEMBLY IN PISTON HOLD DOWN FIXTURE

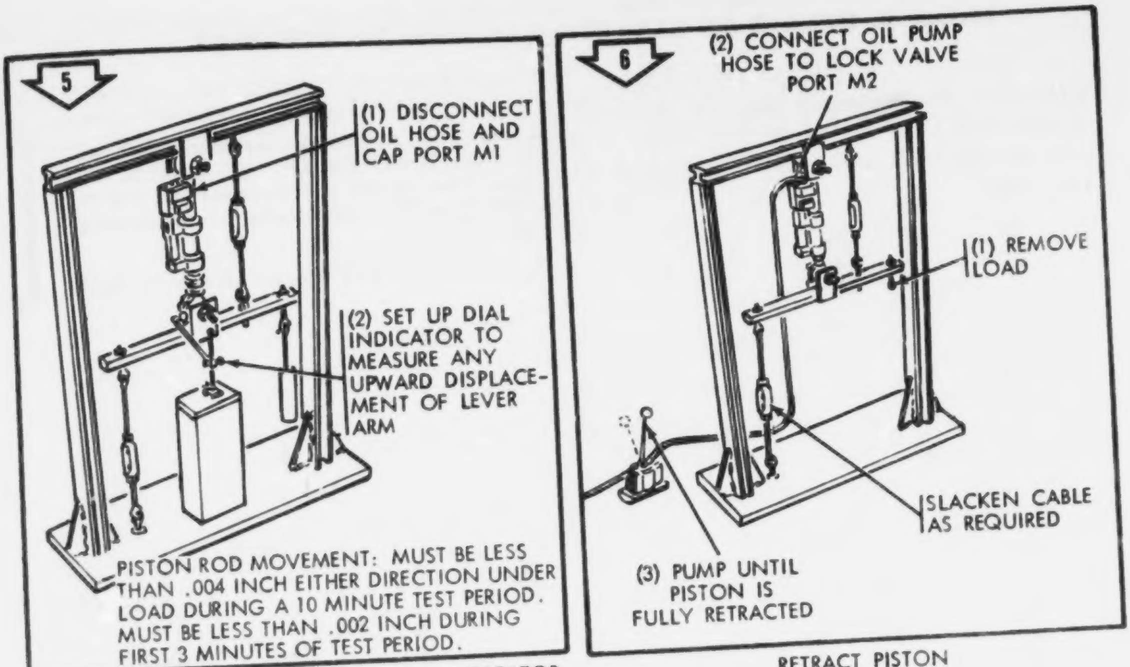

3
(1) ADJUST TO DRAW CABLE TAUT
(2) ATTACH LOAD TO LEVER ARM
LEVER ARM MUST REMAIN LEVEL
4
(2) CONNECT FLEXIBLE OIL HOSE TO PORT M1
(1) CAP ALL PORTS EXCEPT M1
(3) CLOSE BLEEDER VALVES
LEVER ARM TO BE LEVEL
CABLE B MUST BE VERTICAL
(4) PUMP SO THAT PISTON EXTENDS MID POSITION TAKING UP ANY EXISTING SLACK IN CABLE B
ALLOW SUFFICIENT SLACK SO THAT IF LEVER ARM RIDES UP SLIGHTLY, CABLE A WILL NOT RESTRICT MOVEMENT OF ARM

ADJUST CABLE AND ATTACH LOAD

CONNECT HYDRAULIC OIL PUMP TO LOCK VALVE AND EXTEND PISTON SLIGHTLY

WE 9740

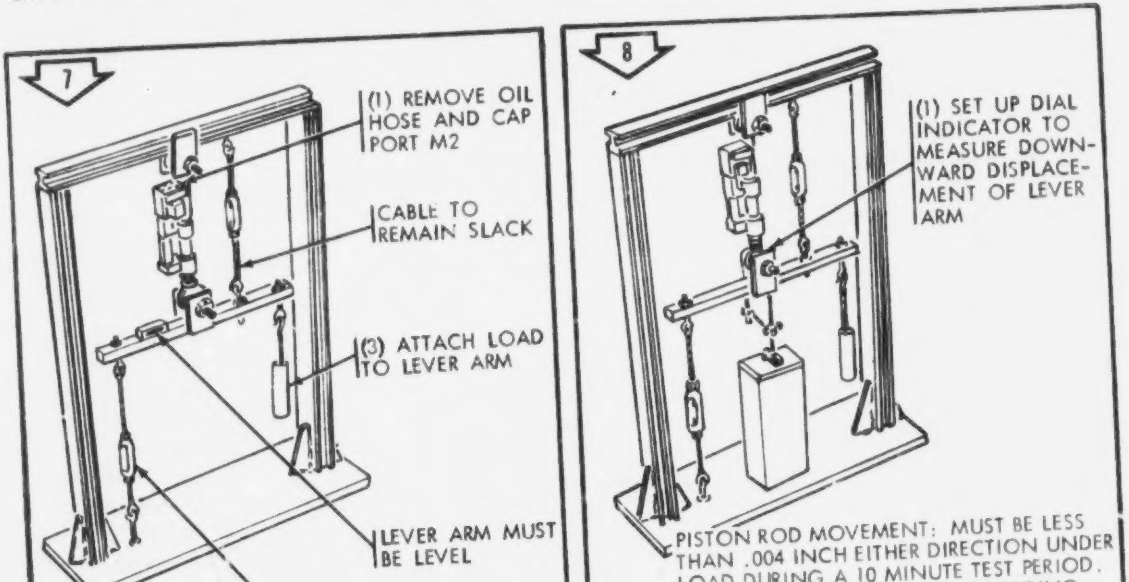
Figure 4-10. Piston holding test (1 of 2).


5
(1) DISCONNECT OIL HOSE AND CAP PORT M1
(2) SET UP DIAL INDICATOR TO MEASURE ANY UPWARD DISPLACEMENT OF LEVER ARM
6
(2) CONNECT OIL PUMP HOSE TO LOCK VALVE PORT M2
(1) REMOVE LOAD
SLACKEN CABLE AS REQUIRED
(3) PUMP UNTIL PISTON IS FULLY RETRACTED

PISTON ROD MOVEMENT: MUST BE LESS THAN .004 INCH EITHER DIRECTION UNDER LOAD DURING A 10 MINUTE TEST PERIOD. MUST BE LESS THAN .002 INCH DURING FIRST 3 MINUTES OF TEST PERIOD.

CHECK FOR PISTON CREEP WITH DIAL INDICATOR

RETRACT PISTON


7
(1) REMOVE OIL HOSE AND CAP PORT M2
CABLE TO REMAIN SLACK
(3) ATTACH LOAD TO LEVER ARM
LEVER ARM MUST BE LEVEL
(2) ADJUST TO DRAW CABLE TAUT
8
(1) SET UP DIAL INDICATOR TO MEASURE DOWNWARD DISPLACEMENT OF LEVER ARM

PISTON ROD MOVEMENT: MUST BE LESS THAN .004 INCH EITHER DIRECTION UNDER LOAD DURING A 10 MINUTE TEST PERIOD. MUST BE LESS THAN .002 INCH DURING FIRST 3 MINUTES OF TEST PERIOD.

ADJUST CABLES AND ATTACH LOAD

CHECK FOR PISTON CREEP WITH DIAL INDICATOR

WE 12696

Figure 4-11. Piston holding test (2 of 2).

Section II. REPAIR OF ELEVATING MECHANISM ASSEMBLY

4-3. Elevating Mechanism Assembly (Less Relief and Lock Valve Assemblies)

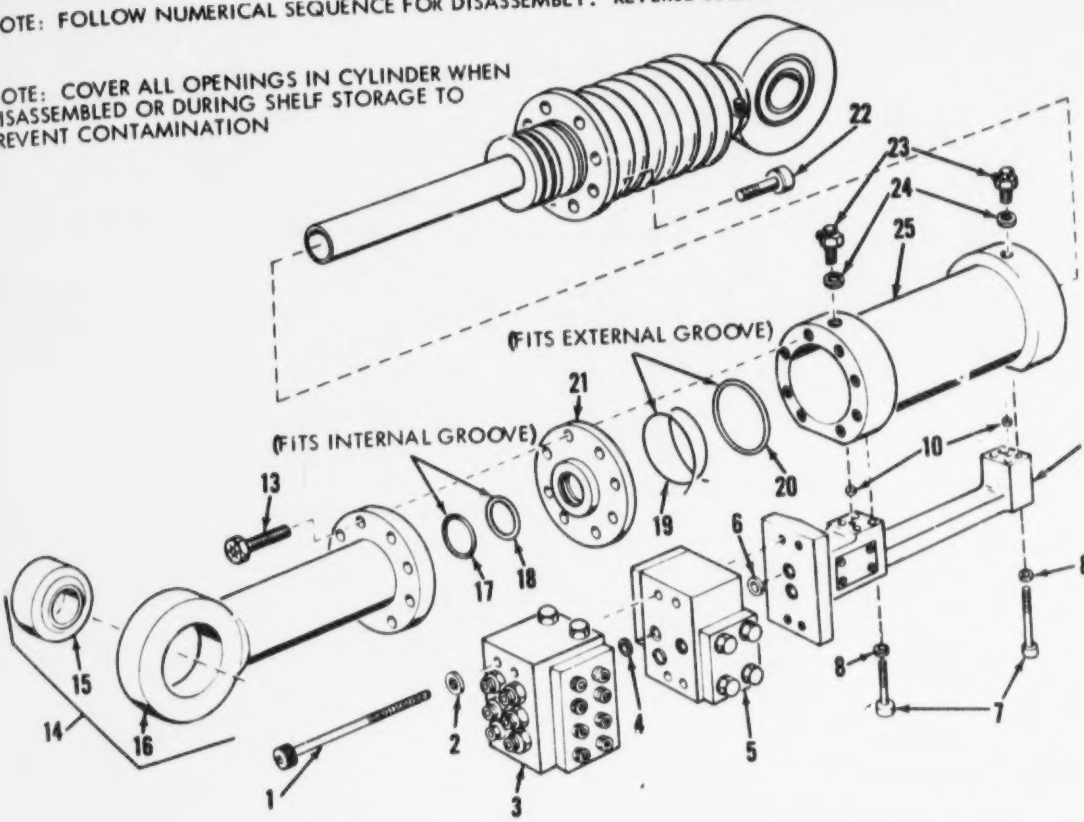
a. Disassembly / Assembly. Refer to figures 4-12 and 4-13.

NOTE

At assembly, replace all components which are contained in REPAIR KIT 1015-928-6191. See table 7 for identity of components and TM 9-1000-213-35P for authorization for requisitioning kit.

b. Inspection and Repair. Refer to table

NOTE: FOLLOW NUMERICAL SEQUENCE FOR DISASSEMBLY. REVERSE SEQUENCE FOR ASSEMBLY.


NOTE: COVER ALL OPENINGS IN CYLINDER WHEN DISASSEMBLED OR DURING SHELF STORAGE TO PREVENT CONTAMINATION

ASSEMBLY NOTES:

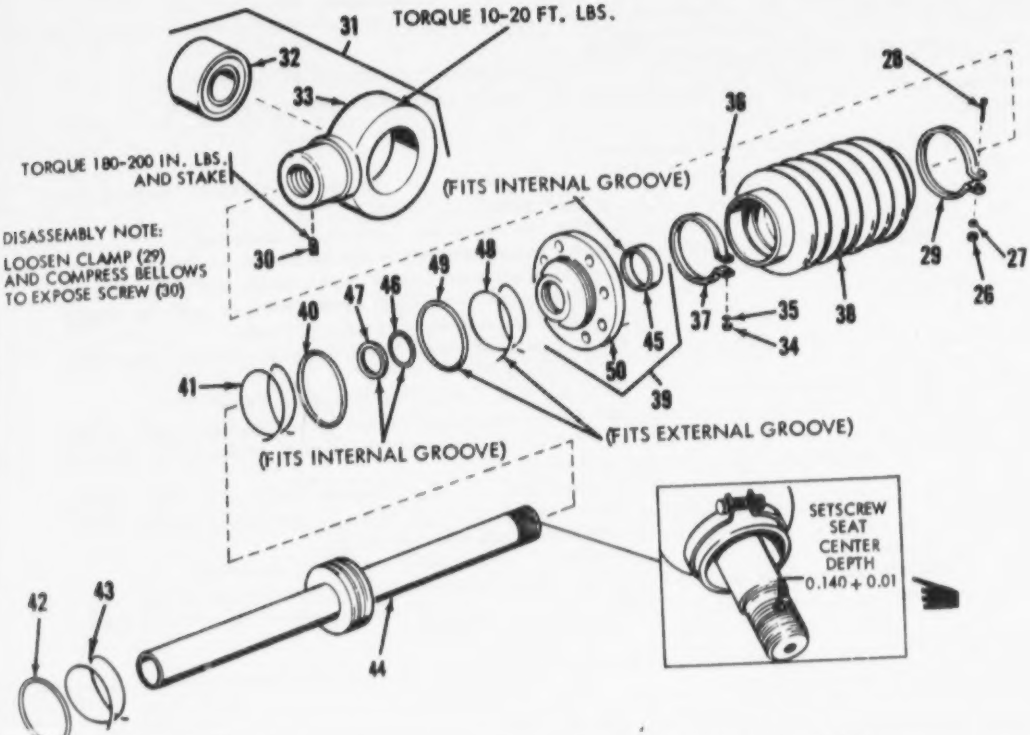
1. FOR MANDATORY REPLACEMENT PARTS, REFER TO TABLE 7.
2. AVOID DAMAGING PACKING WHEN INSTALLING CYLINDER (25) OVER PISTON.
3. AVOID DAMAGING PACKINGS (18 AND 20) WHEN INSTALLING GUIDE (21).
4. UPON COMPLETING ASSEMBLY PERFORM TESTS DESCRIBED IN PARA. 4-2.

WE 67901

LEGEND to fig. 4-12:

1—Screw (4)
2—Washer (4)
3—Valve assembly
4—Packing (2)
5—Valve
6—Packing (2)
7—Screw (8)
8—Washer (8)
9—Manifold
10—Packing
11—Deleted
12—Deleted
13—Bolt (8)
14—Sleeve assembly
15—Bearing
16—Sleeve
17—Retainer
18—Packing
19—Retainer
20—Packing
21—Guide
22—Bolt
23—Valve assembly
24—Packing
25—Cylinder

Figure 4-12. Disassembly / assembly of elevating mechanism assembly (1 of 2).


31
TORQUE 10-20 FT. LBS.
32
33
28
36
TORQUE 180-200 IN. LBS. AND STAKE
(FITS INTERNAL GROOVE)
DISASSEMBLY NOTE:
LOOSEN CLAMP (29) AND COMPRESS BELLOWS TO EXPOSE SCREW (30)
30
49
48
47
46
40
45
50
39
37
35
34
38
29
27
26
41
(FITS EXTERNAL GROOVE)
(FITS INTERNAL GROOVE)
SETSCREW SEAT CENTER DEPTH 0.140 + 0.01
42
43
44

ASSEMBLY NOTES:

1. AVOID DAMAGING OIL SEAL (45) AND PACKING WHEN INSTALLING GUIDE ASSEMBLY (39).
2. WHEN REPLACING PISTON (44) USE FOLLOWING PROCEDURE TO ESTABLISH SEAT FOR SETSCREW (30).
   A. BOTTOM PISTON IN EYE END AND TORQUE 10 TO 20 FT. LBS.
   B. INSERT 0.332 INCH DIAMETER Q DRILL IN THREADED SETSCREW HOLE IN EYE END. BEING CAREFUL NOT TO DAMAGE THREADED SETSCREW HOLE, DRILL INTO PISTON SHAFT JUST DEEP ENOUGH TO ESTABLISH A CENTER POINT.
   C. REMOVE EYE END FROM PISTON SHAFT. USING A 25/64 DRILL GROUND TO 90° POINT, DRILL SETSCREW SEAT UNTIL CENTER DEPTH EQUALS 0.140 + 0.01 INCHES. SET INSET.
   D. CLEAN THREADS AROUND SEAT WITH A WEDGE SHAPED STONE.
3. BOTTOM PISTON IN EYE END AND ALIGN SETSCREW HOLE WITH SEAT. TORQUE SETSCREW 180-200 IN. LBS.
4. STAKE SETSCREW (30).

WE 67942

LEGEND to fig. 4-13:

26—Nut
27—Washer
28—Screw
29—Clamp
30—Setscrew
31—Eye assembly
32—Bearing
33—End eye
34—Nut
35—Washer
36—Screw
37—Clamp
38—Bellows
39—Guide assembly
40—Packing
41—Retainer
42—Packing
43—Retainer
44—Piston
45—Seal
46—Retainer
47—Packing
48—Retainer
49—Packing
50—Guide

Figure 4-13. Disassembly / assembly of elevating mechanism assembly (2 of 2).

Table 7. Inspection of Elevating Mechanism

NOTE

Item 4, 6, 10, 13, 17, 18, 19, 20, 22, 24, figure 4-12 and items 40, 41, 42, 43, 45, 46, 47, 48, 49, figure 4-13 (contained in REPAIR KIT 1015-928-6191) must be replaced each time elevating mechanism is disassembled.

Figure	Item	Component	Serviceability criteria
4-12	9	Manifold	No cracks, breaks, or distortion. Machined surfaces not nicked, pitted, or burred.
4-13	33	Eye	Casting free of cracks. Threads not damaged.
4-12	16	Sleeve	Flanged mating surface not nicked, burred, or pitted.
4-12	21	Guide	Machined surfaces free of nicks, burs, and pits. Any rematching to reestablish metal surfaces will be accomplished maintaining surface squareness. Replace guide if minor inside diameter is worn larger than 1.2505-inches.
4-12	23	Valve assembly	Must not leak. Capable of complete closure.
4-12	25	Cylinder	Threads not damaged. Bore not out of round or worn to extent of not functioning properly. Mating surfaces free of nicks and burs. ID wear limit......2.752-inches. If ID dimensions exceeds this wear limit or if repair is necessary, replace entire elevating mechanism assembly.
4-13	29,37	Clamps	Capable of holding bellows securely to surfaces.
4-13	38	Bellows	Capable of preventing entrance or foreign materials.
4-13	44	Piston	No scratches, scoring, or nicks. Replace if diameter of shaft is worn below 1.2480-inch.

4-4. Relief Valve Assembly

a. Disassembly / Assembly. Refer to figure 4-14.

b. Inspection and Repair. Refer to table 8.

4-5. Lock Valve Assembly

a. Disassembly / Assembly. Refer to figure 4-15.

NOTE

At assembly, replace all components which are contained in REPAIR KIT 1015-928-6192. See table 9 for identity of components and TM 9-1000-213-35P for authorization for requisitioning kit.

b. Inspection and Repair. Refer to table 9.

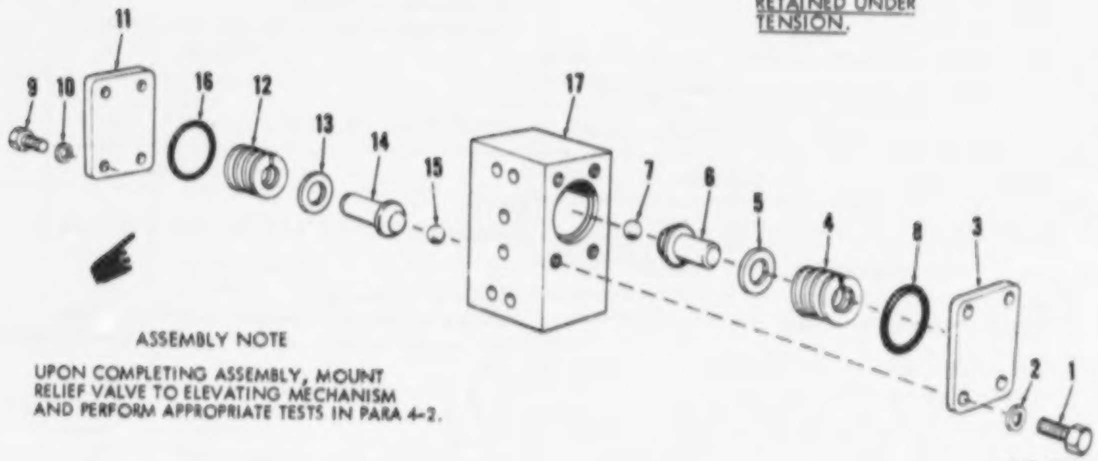
Table 8. Inspection of Relief Valve Assembly

Figure	Item	Component	Serviceability criteria
4-14	3, 11	Plate	Mating surfaces not scratched, burred, nicked, or pitted.
4-14	4, 12	Spring	Must not be cracked or have extreme set. Free overall length .... 1.540-inches.
4-14	6, 14	Guide	Free of nicks, burs, and pits.
4-14	7, 15	Ball	No corrosion or oitting.
4-14	17	Block	Mating surfaces free of nicks, pits, burs, and scores.

Table 9. Inspection of Lock Valve Assembly

Figure	Item	Component	Serviceability criteria
	NOTE Items 6, 7, 10, 16, 17, 20, 22, 27, figure 4-15 (contained in REPAIR KIT 1015-928-6192) must be replaced each time lock valve is disassembled.		
4-15	26	Plug	Threads not damaged.
4-15	3, 13	Plate	Mating surface not scratched, nicked, or pitted.
4-15	8, 18	Spring	Not cracked or have extreme set. Free overall length-0.750-inch.
4-15	9, 19	Cup	Free of pits and scratches. Remove raised surfaces.
4-15	4, 14	Spring	Not cracked or have extreme set. Free overall length-0.895-inch.
4-15	5, 15	Guide	Free of nicks, burs, or pits.
4-15	29	Body	Mating surfaces free of nicks, pits, burs, and scores.

NOTE: FOLLOW NUMERIC SEQUENCE FOR DISASSEMBLY.
REVERSE SEQUENCE FOR ASSEMBLY.



WARNING: SPRINGS (ITEMS 4 AND 12) RETAINED UNDER TENSION.

ASSEMBLY NOTE

UPON COMPLETING ASSEMBLY, MOUNT RELIEF VALVE TO ELEVATING MECHANISM AND PERFORM APPROPRIATE TESTS IN PARA 4-2.

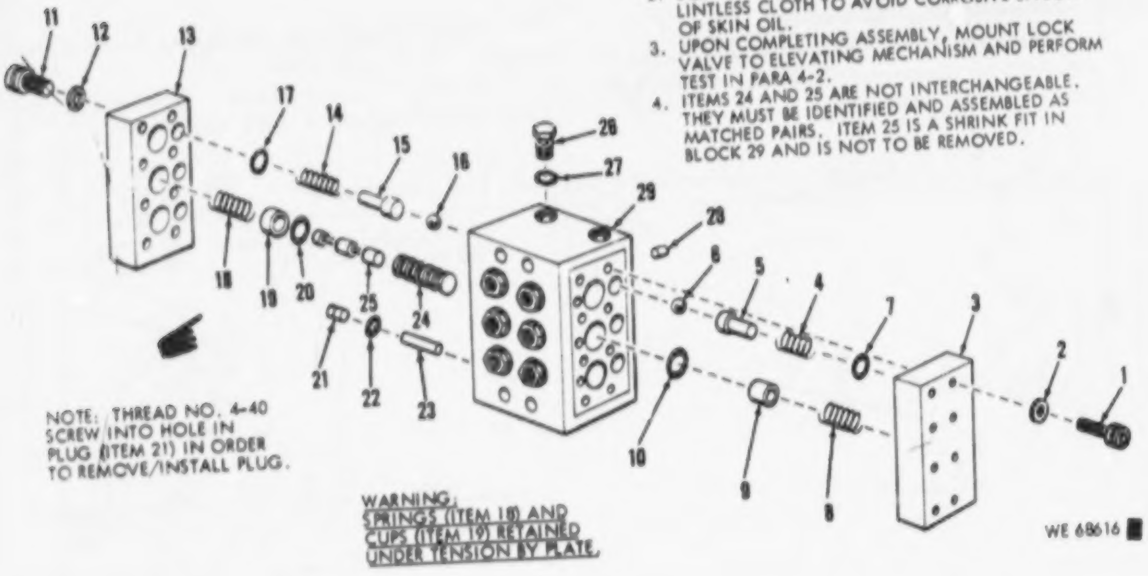
WE 68588

LEGEND to fig. 4-14:

1—Screw (4)
2—Washer (4)
3—Plate
4—Spring
5—Shim (as required)
6—Guide
7—Ball
8—Packing
9—Screw (4)
10—Washer (4)
11—Plate
12—Spring
13—Shim (as required
14—Guide
15—Ball
16—Packing
17—Block

Figure 4-14. Disassembly/assembly of relief valve assembly.

NOTE: FOLLOW NUMERICAL SEQUENCE FOR DISASSEMBLY. REVERSE SEQUENCE FOR ASSEMBLY.



ASSEMBLY NOTES

1. FOR MANDATORY REPLACEMENT PARTS, REFER TO TABLE 9.
2. DURING ASSEMBLY, HANDLE PARTS WITH CLEAN LINTLESS CLOTH TO AVOID CORROSIVE EFFECTS OF SKIN OIL.
3. UPON COMPLETING ASSEMBLY, MOUNT LOCK VALVE TO ELEVATING MECHANISM AND PERFORM TEST IN PARA 4-2.
4. ITEMS 24 AND 25 ARE NOT INTERCHANGEABLE. THEY MUST BE IDENTIFIED AND ASSEMBLED AS MATCHED PAIRS. ITEM 25 IS A SHRINK FIT IN BLOCK 29 AND IS NOT TO BE REMOVED.

NOTE: THREAD NO. 4-40 SCREW INTO HOLE IN PLUG (ITEM 21) IN ORDER TO REMOVE/INSTALL PLUG.

WARNING:
SPRINGS (ITEM 18) AND CUPS (ITEM 19) RETAINED UNDER TENSION BY PLATE.

LEGEND to fig. 4-15:

1—Screw (8)
2—Washer (8)
3—Plate
4—Spring (3)
5—Guide (3)
6—Ball (3)
7—Packing (3)
8—Spring (3)
9—Cup (3)
10—Packing (3)
11—Screw (8)
12—Washer (8)
13—Plate
14—Spring (3)
15—Guide (3)
16—Ball (3)
17—Packing (3)
18—Spring (3)
19—Cap (3)
20—Packing (3)
21—Plug (3)
22—Packing (3)
23—Pin (3)
24—Sleeve (3)
25—Spool (3)
26—Plug (2)
27—Packing (2)
28—Pin (10)
29—Body

Figure 4-15. Disassembly/assembly of lock valve assembly.

Section III. REPAIR OF REPLENISHER AND MISCELLANEOUS MOUNT COMPONENTS

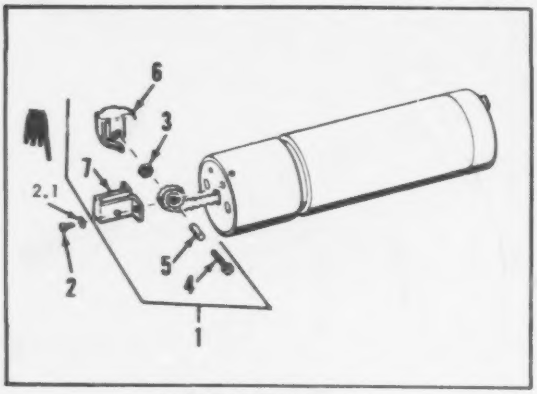
4-6. Disassembly / Assembly

a. *Replenisher Assembly.* Refer to figures 4-16 and 4-17 for disassembly and figures 4-18, 4-19, and 4-20 for assembly.

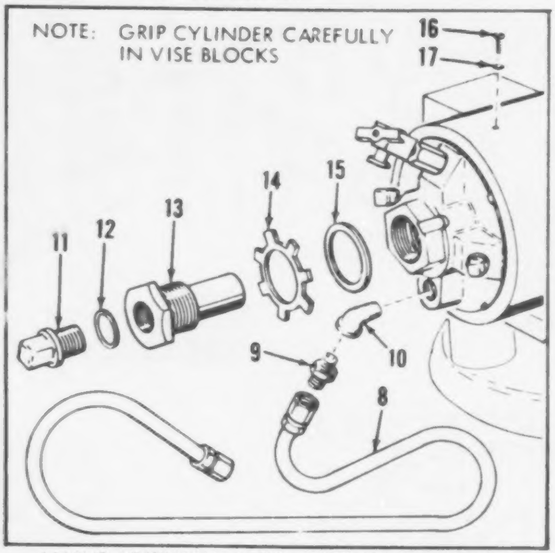
b. *Shield, Cradle, and Mounting Parts.* Refer to figures 4-21 and 4-22.

c. *Ejector Mechanism Bracket and Cam.* Refer to figures 4-23 and 4-24.

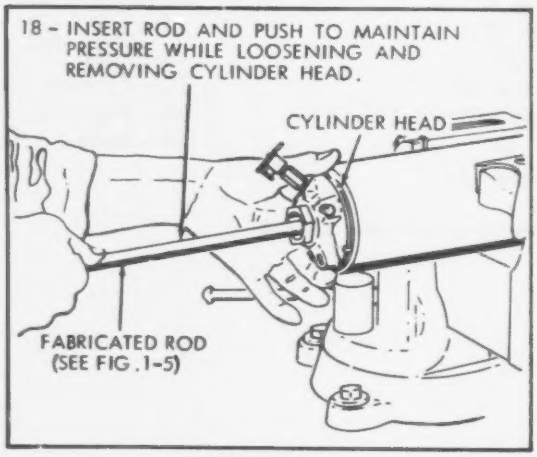
NOTE: FOLLOW NUMERIC SEQUENCE FOR DISASSEMBLY.



INDICATOR ASSEMBLY


NOTE: GRIP CYLINDER CAREFULLY IN VISE BLOCKS

VALVE ASSEMBLY, HOSE, AND COMPONENTS

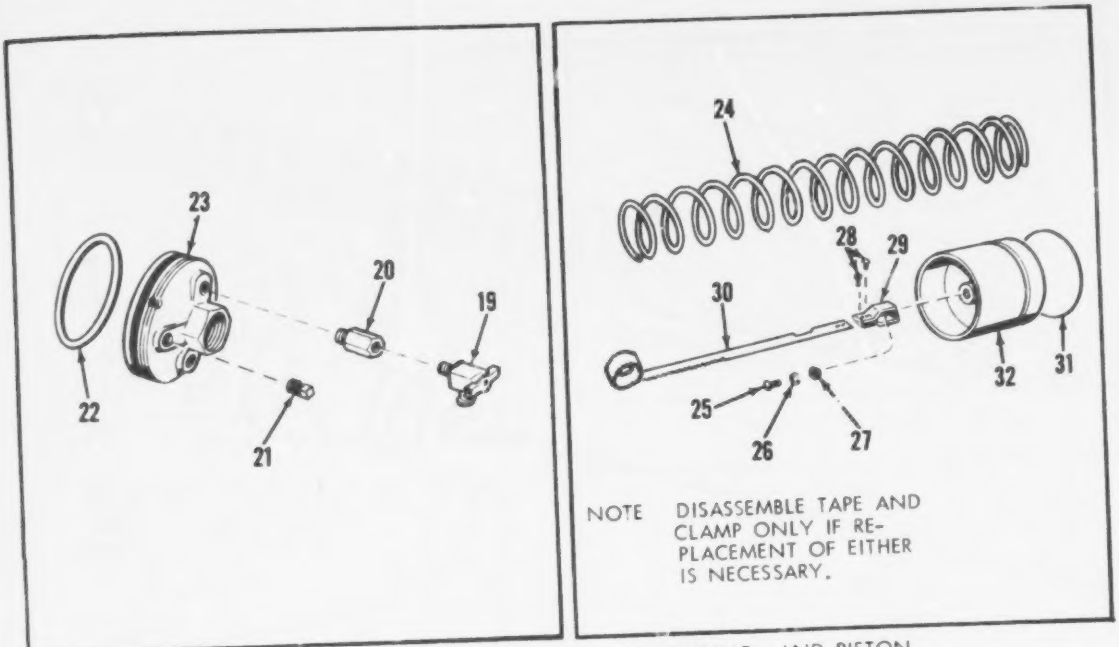

18 - INSERT ROD AND PUSH TO MAINTAIN PRESSURE WHILE LOOSENING AND REMOVING CYLINDER HEAD.

FABRICATED ROD

1 - INDICATOR ASSEMBLY
2 - SCREW (2)
2.1 - WASHER
3 - NUT
4 - SCREW
5 - PIN
6 - GUIDE
7 - BRACKET
8 - HOSE
9 - ADAPTER
10 - ELBOW
11 - PLUG
12 - WASHER
13 - VALVE ASSEMBLY
14 - WASHER
15 - SPACER
16 - SETSCREW
17 - WASHER

WE 67945

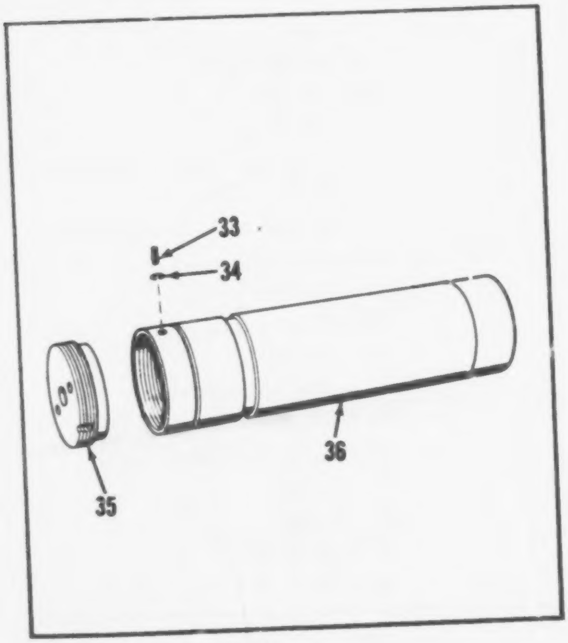
Figure 4-16. Disassembly of replenisher (1 of 2).


23
20
19
22
21
24
28
29
30
32
31
25
26
27

NOTE DISASSEMBLE TAPE AND CLAMP ONLY IF REPLACEMENT OF EITHER IS NECESSARY.

HEAD ASSEMBLY AND PARTS.

TAPE, SPRING, AND PISTON.



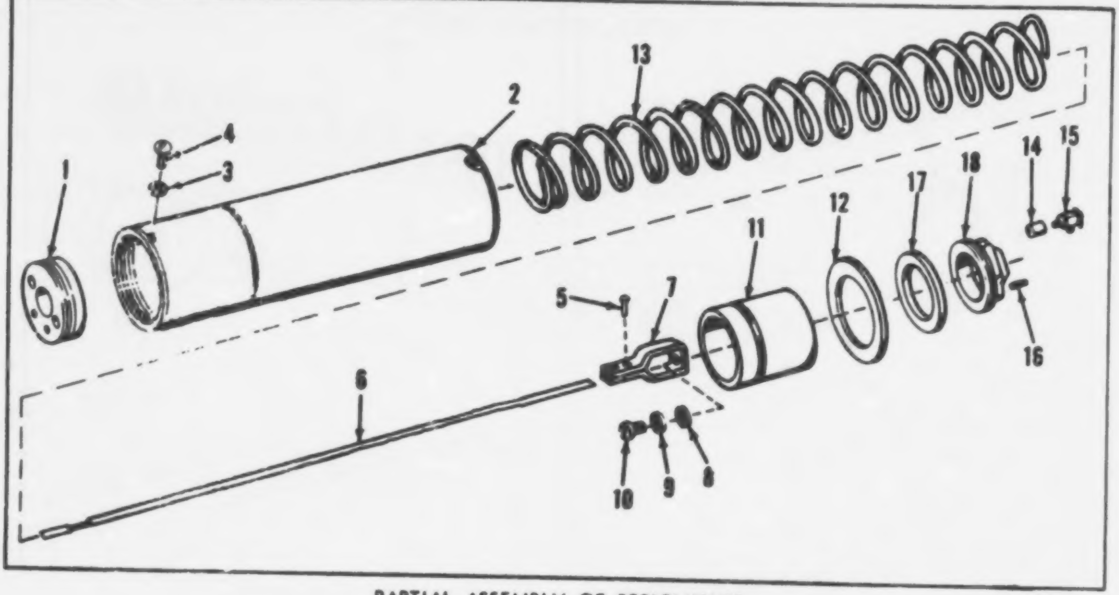
CAP AND CYLINDER.

19 — COCK
20 — COUPLING PIPE
21 — PLUG
22 — PACKING
23 — HEAD
24 — SPRING
25 — SCREW
26 — WASHER
27 — BEARING
28 — RIVET (2)
29 — CLAMP
30 — TAPE
31 — SEAL ASSEMBLY
32 — PISTON
33 — SETSCREW
34 — WASHER
35 — CAP
36 — CYLINDER

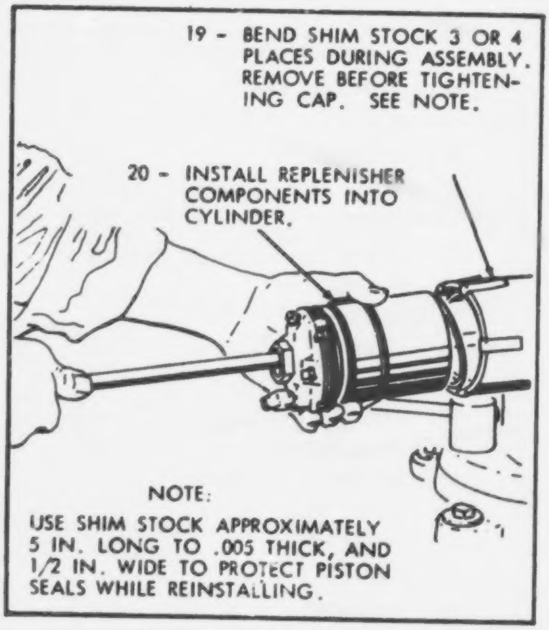
WE 9805

Figure 4-17. Disassembly of replenisher (2 of 2).

NOTE: FOLLOW NUMERICAL SEQUENCE FOR ASSEMBLY.



PARTIAL ASSEMBLY OF REPLENISHER.



19 - BEND SHIM STOCK 3 OR 4 PLACES DURING ASSEMBLY. REMOVE BEFORE TIGHTENING CAP. SEE NOTE.

20 - INSTALL REPLENISHER COMPONENTS INTO CYLINDER.

NOTE:

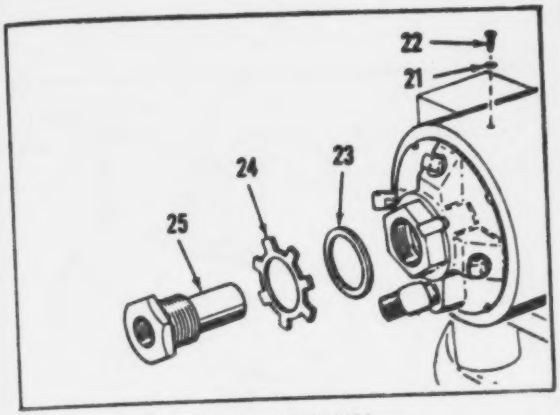
USE SHIM STOCK APPROXIMATELY 5 IN. LONG TO .005 THICK, AND 1/2 IN. WIDE TO PROTECT PISTON SEALS WHILE REINSTALLING.

HEAD, PISTON AND SPRING.

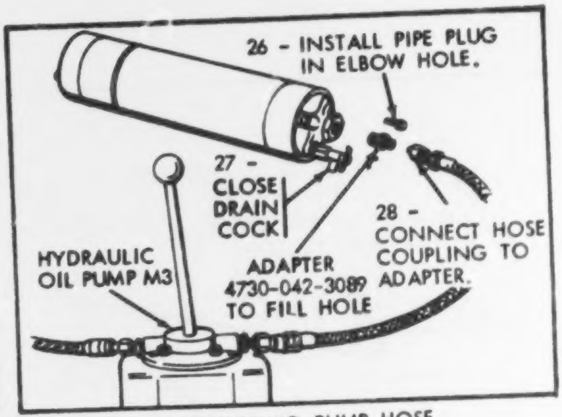
1 - CAP
2 - CYLINDER
3 - WASHER
4 - SETSCREW
5 - RIVET (2)
6 - TAPE
7 - CLAMP
8 - BEARING
9 - WASHER
10 - SCREW
11 - PISTON
12 - SEAL ASSEMBLY
13 - SPRING
14 - COUPLING PIPE
15 - COCK
16 - PLUG
17 - PACKING
18 - HEAD

WE 67902

Figure 4-18. Assembly of replenisher (1 of 3).



VALVE ASSEMBLY.

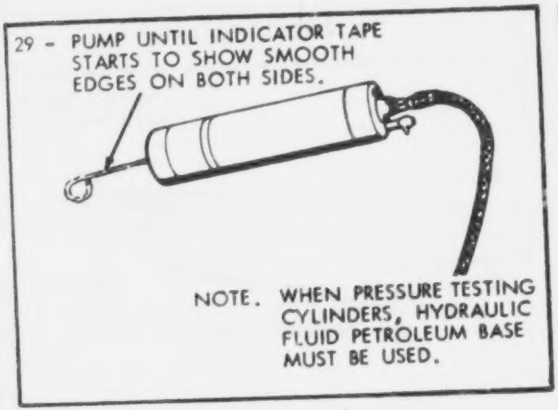

26 - INSTALL PIPE PLUG IN ELBOW HOLE.

27 - CLOSE DRAIN COCK

28 - CONNECT HOSE COUPLING TO ADAPTER.

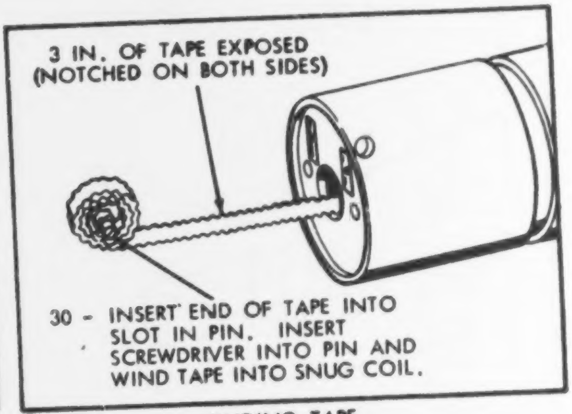
ADAPTER 4730-042-3089 TO FILL HOLE

CONNECTING PUMP HOSE.


29 - PUMP UNTIL INDICATOR TAPE STARTS TO SHOW SMOOTH EDGES ON BOTH SIDES.

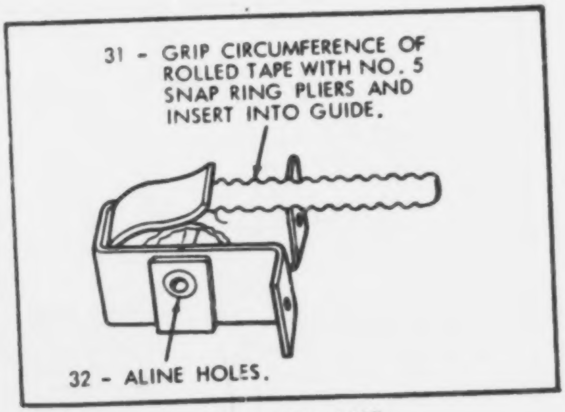
NOTE. WHEN PRESSURE TESTING CYLINDERS, HYDRAULIC FLUID PETROLEUM BASE MUST BE USED.

PUMPING TAPE.


3 IN. OF TAPE EXPOSED (NOTCHED ON BOTH SIDES)

30 - INSERT END OF TAPE INTO SLOT IN PIN. INSERT SCREWDRIVER INTO PIN AND WIND TAPE INTO SNUG COIL.

WINDING TAPE.


31 - GRIP CIRCUMFERENCE OF ROLLED TAPE WITH NO. 5 SNAP RING PLIERS AND INSERT INTO GUIDE.

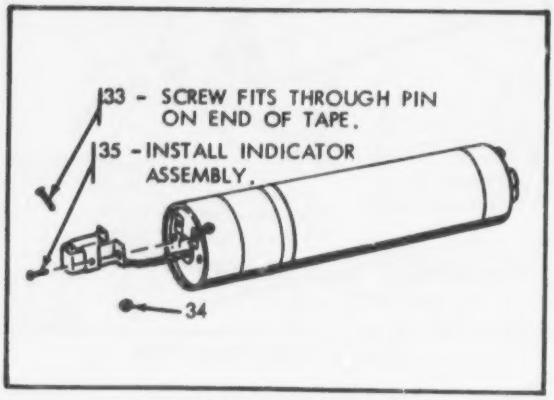
32 - ALINE HOLES.

INSTALLING TAPE.

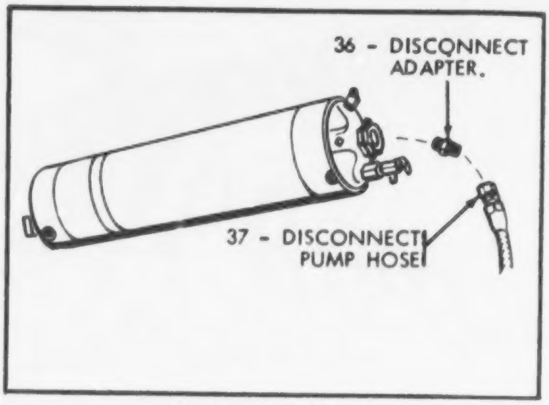
21 - WASHER
22 - SETSCREW
23 - SPACER
24 - WASHER
25 - VALVE ASSEMBLY

WE 67903

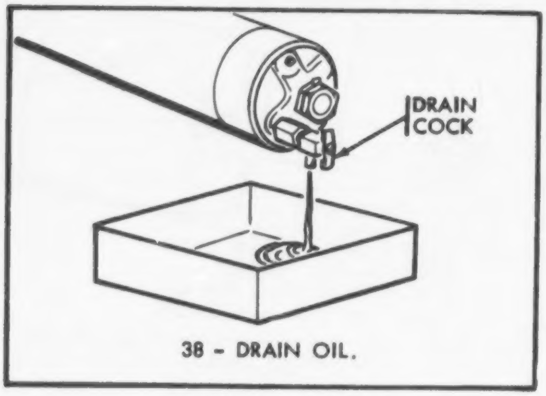
Figure 4-19. Assembly of replenisher (2 of 3).


33 - SCREW FITS THROUGH PIN
ON END OF TAPE.
35 - INSTALL INDICATOR
ASSEMBLY.
34

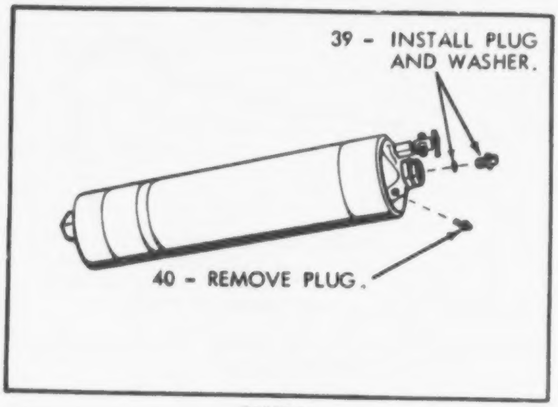
INDICATOR ASSEMBLY.


36 - DISCONNECT
ADAPTER.
37 - DISCONNECT
PUMP HOSE

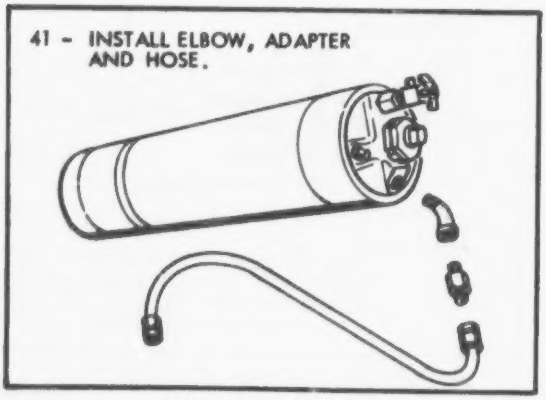
DISCONNECTING PUMP.


DRAIN
COCK
38 - DRAIN OIL.

DRAINING CYLINDER.


39 - INSTALL PLUG
AND WASHER.
40 - REMOVE PLUG.

PLUGS.

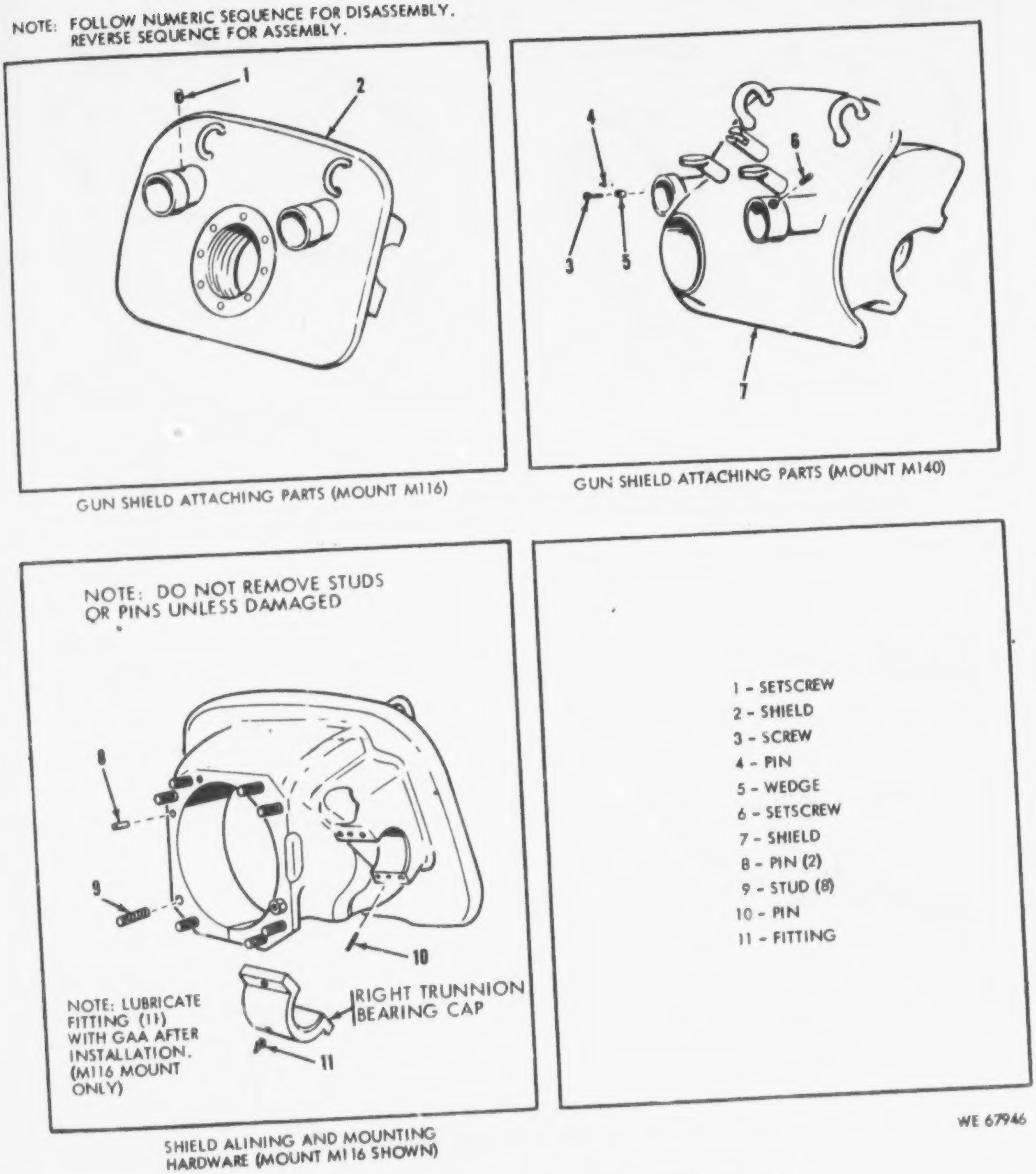

41 - INSTALL ELBOW, ADAPTER
AND HOSE.

INSTALLING HOSE.

WE 67904

Figure 4-20. Assembly of replenisher (3 of 3).

NOTE: FOLLOW NUMERIC SEQUENCE FOR DISASSEMBLY.
REVERSE SEQUENCE FOR ASSEMBLY.



GUN SHIELD ATTACHING PARTS (MOUNT M116)

GUN SHIELD ATTACHING PARTS (MOUNT M140)

NOTE: DO NOT REMOVE STUDS OR PINS UNLESS DAMAGED

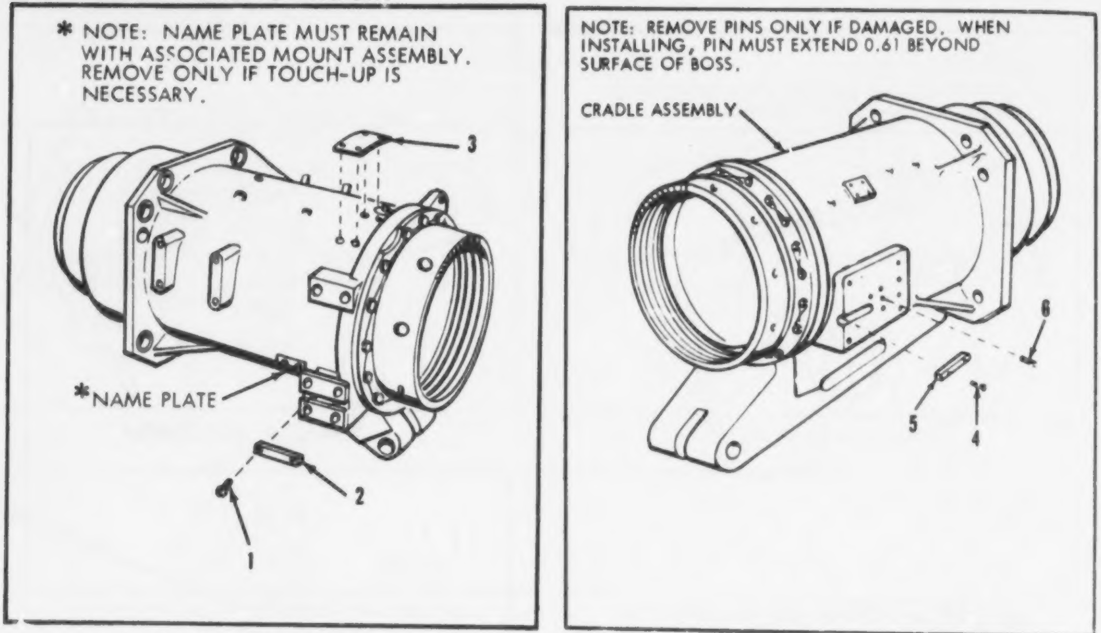
NOTE: LUBRICATE FITTING (11) WITH GAA AFTER INSTALLATION. (M116 MOUNT ONLY)

SHIELD ALINING AND MOUNTING HARDWARE (MOUNT M116 SHOWN)

1 - SETSCREW
2 - SHIELD
3 - SCREW
4 - PIN
5 - WEDGE
6 - SETSCREW
7 - SHIELD
8 - PIN (2)
9 - STUD (8)
10 - PIN
11 - FITTING

Figure 4-21. Disassembly/assembly of gun shield attaching parts.

NOTE: FOLLOW NUMERIC SEQUENCE FOR DISASSEMBLY.
REVERSE SEQUENCE FOR ASSEMBLY.

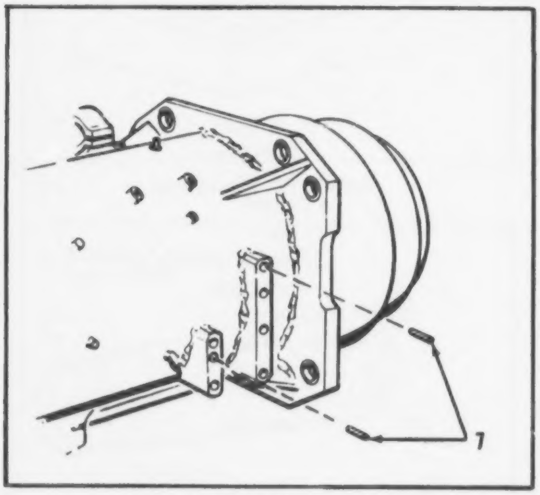


* NOTE: NAME PLATE MUST REMAIN WITH ASSOCIATED MOUNT ASSEMBLY. REMOVE ONLY IF TOUCH-UP IS NECESSARY.

NOTE: REMOVE PINS ONLY IF DAMAGED. WHEN INSTALLING, PIN MUST EXTEND 0.61 BEYOND SURFACE OF BOSS.

DECAL NAME PLATE, AND KEY
(MOUNT M116 SHOWN)

KEY AND PINS (MOUNT M140 ONLY)



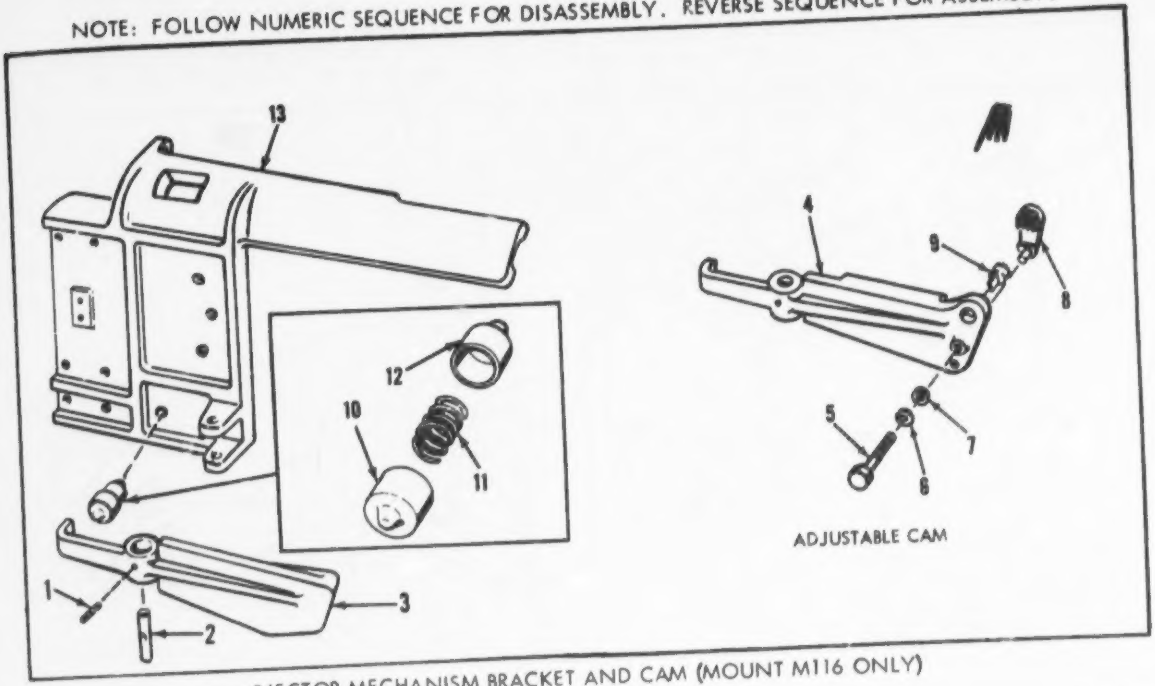
1 - SCREW (2)
2 - KEY
3 - DECAL
4 - SCREW (2)
5 - KEY
6 - PIN (2)
7 - PIN

ALINING PINS (MOUNT M116 ONLY)

WE 67905

Figure 4-22. Disassembly / assembly of cradle attaching parts.

NOTE: FOLLOW NUMERIC SEQUENCE FOR DISASSEMBLY. REVERSE SEQUENCE FOR ASSEMBLY.


13
10
12
11
1
2
3
4
9
8
5
6
7
ADJUSTABLE CAM
EJECTOR MECHANISM BRACKET AND CAM (MOUNT M116 ONLY)

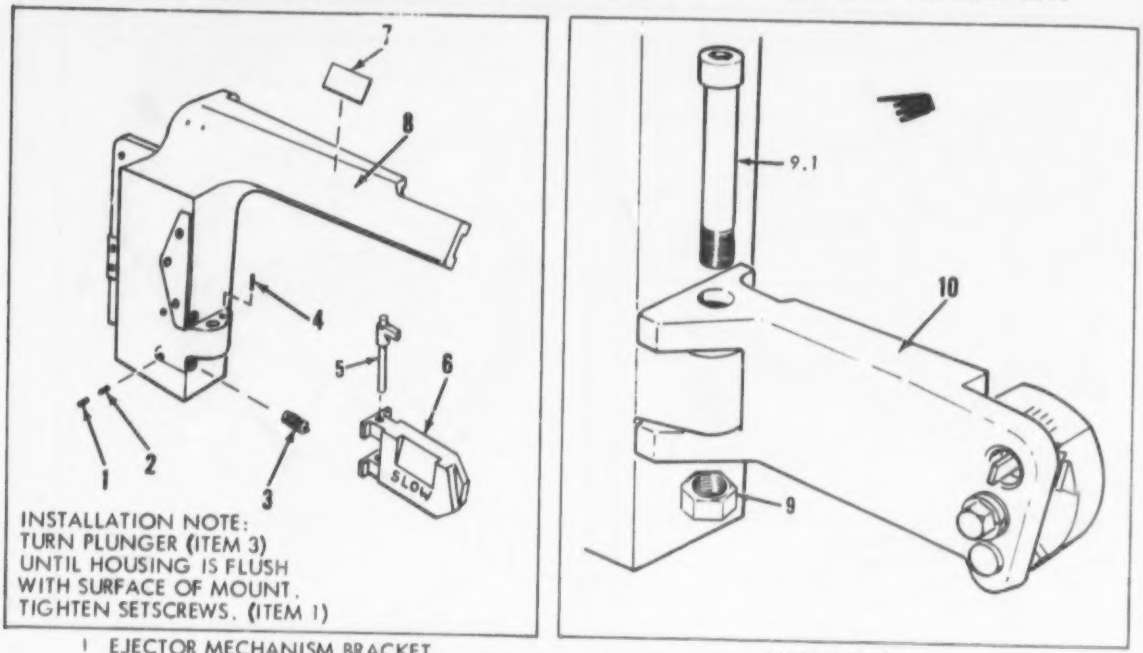
WE 67947

LEGEND to fig. 4-23:

1—Setscrew
2—Pin
3—Cam
4—Cam, bracket
5—Screw
6—Washer
7—Washer
8—Cam
9—Plug
10—Retainer
11—Spring
12—Retainer
13—Bracket

Figure 4-23. Disassembly / assembly of ejector mechanism bracket group (mount M116).

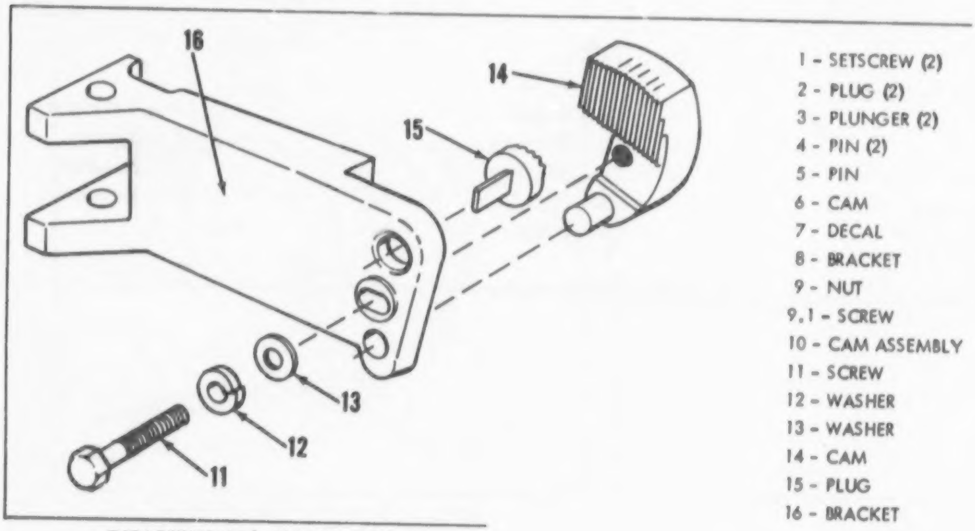
NOTE: FOLLOW NUMERIC SEQUENCE FOR DISASSEMBLY. REVERSE SEQUENCE FOR ASSEMBLY.



INSTALLATION NOTE:
TURN PLUNGER (ITEM 3)
UNTIL HOUSING IS FLUSH
WITH SURFACE OF MOUNT.
TIGHTEN SETSCREWS. (ITEM 1)

EJECTOR MECHANISM BRACKET
AND REVERSIBLE CAM

VARIABLE CAM



DISASSEMBLY/ASSEMBLY OF
VARIABLE CAM

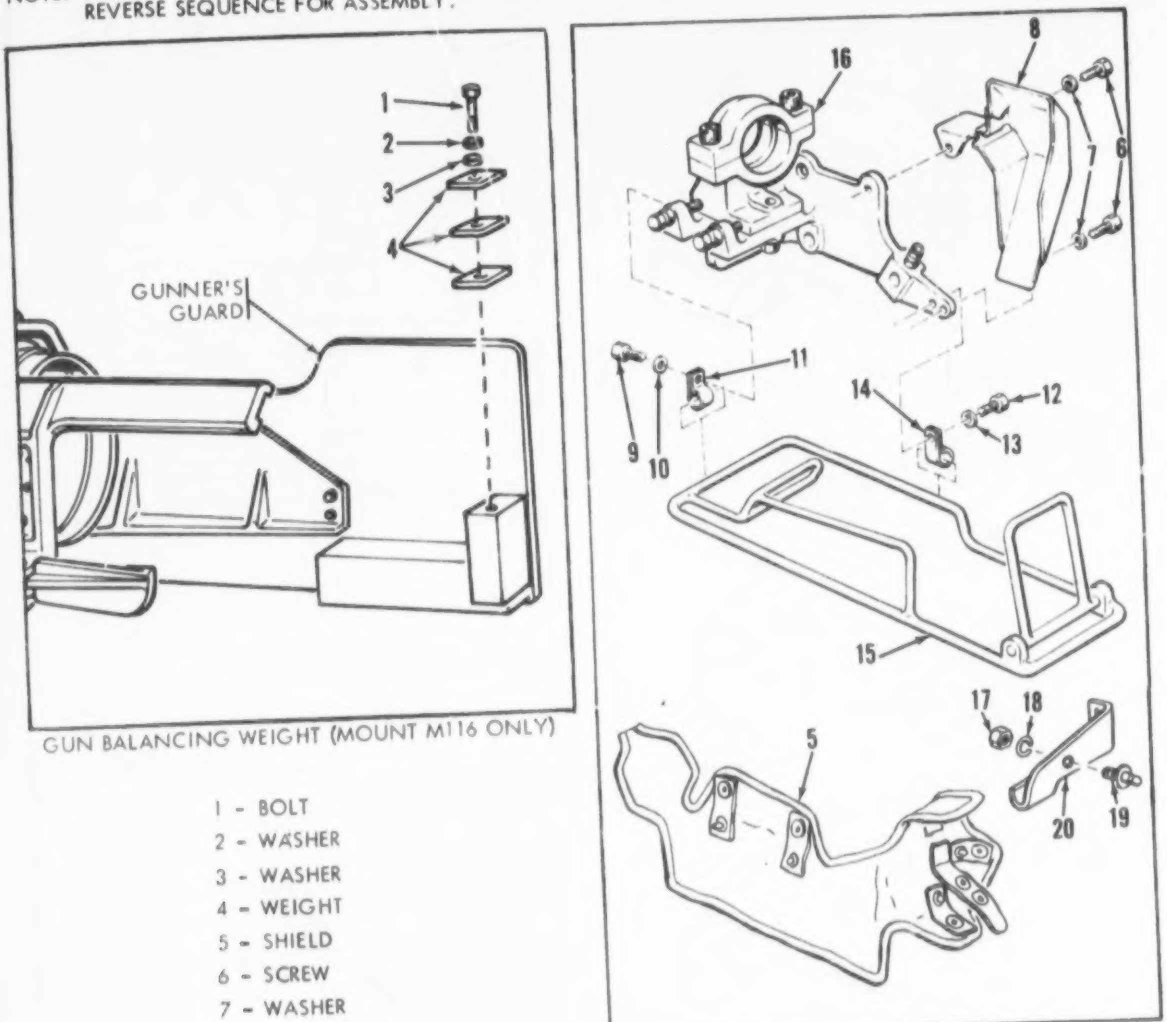
1 - SETSCREW (2)
2 - PLUG (2)
3 - PLUNGER (2)
4 - PIN (2)
5 - PIN
6 - CAM
7 - DECAL
8 - BRACKET
9 - NUT
9.1 - SCREW
10 - CAM ASSEMBLY
11 - SCREW
12 - WASHER
13 - WASHER
14 - CAM
15 - PLUG
16 - BRACKET

WE 67948

Figure 4-24. Disassembly / assembly of ejector mechanism bracket group (mount M140).

d. Balancing Weights and Machine Gun Bracket Group. Refer to figure 4-25.

NOTE: FOLLOW NUMERIC SEQUENCE FOR DISASSEMBLY.
REVERSE SEQUENCE FOR ASSEMBLY.



GUN BALANCING WEIGHT (MOUNT M116 ONLY)

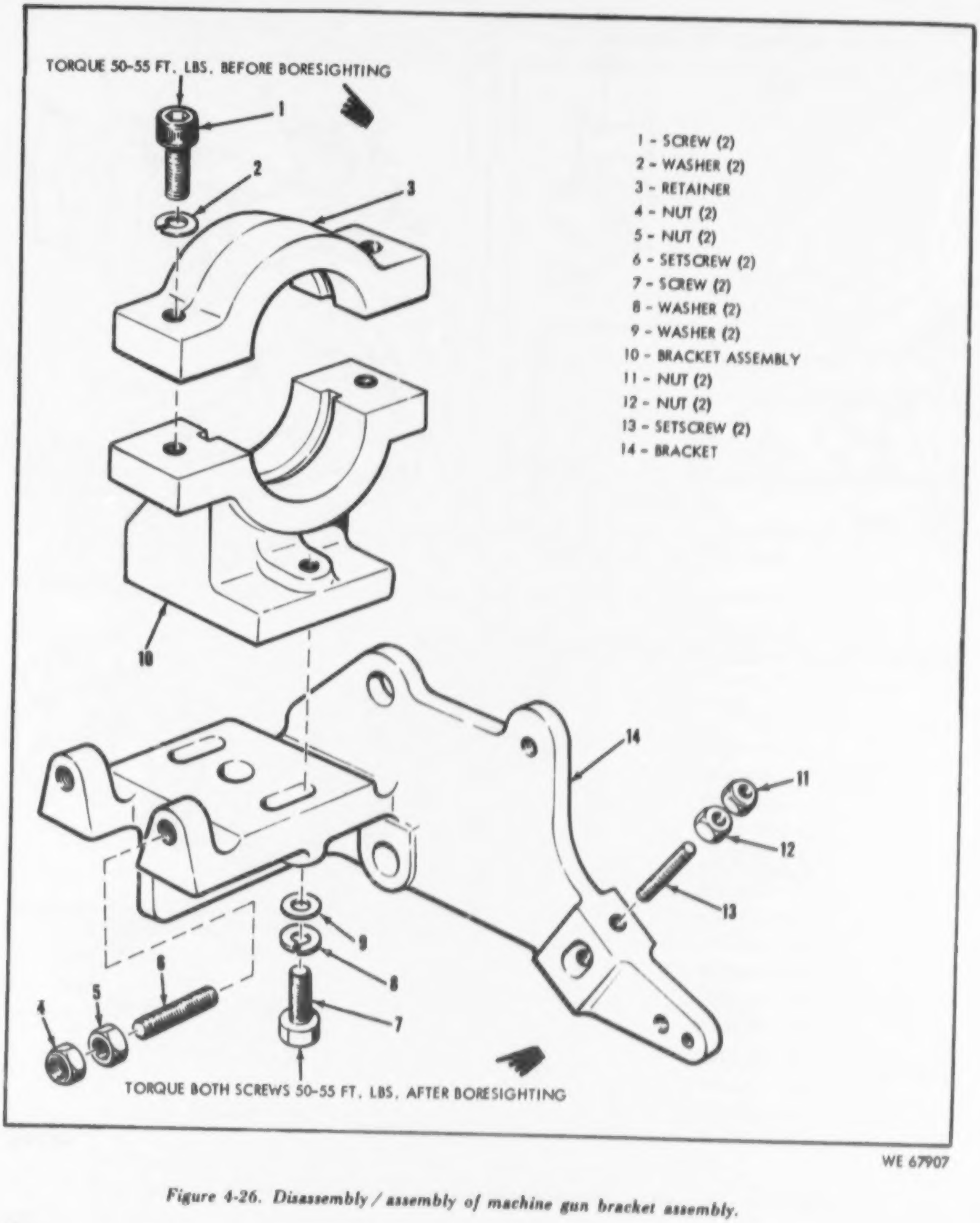
MACHINE GUN BRACKET GROUP ASSEMBLY

1 - BOLT
2 - WASHER
3 - WASHER
4 - WEIGHT
5 - SHIELD
6 - SCREW
7 - WASHER
8 - PLATE
9 - SCREW
10 - WASHER
11 - CLAMP
12 - SCREW
13 - WASHER
14 - CLAMP
15 - SUPPORT
16 - BRACKET ASSEMBLY
17 - NUT
18 - WASHER
19 - STUD
20 - BRACKET

WE 67906

Figure 4-25. Disassembly / assembly of balancing weights and machine gun bracket group.

e. Machine Gun Bracket Assembly. Refer to figure 4-26.

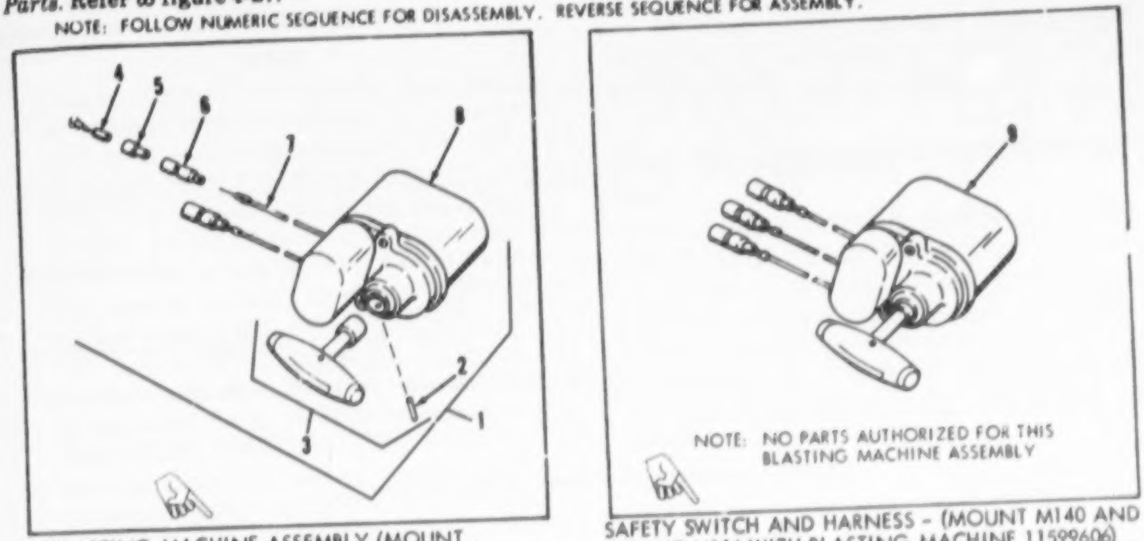

TORQUE 50-55 FT. LBS. BEFORE BORESIGHTING
1 - SCREW (2)
2 - WASHER (2)
3 - RETAINER
4 - NUT (2)
5 - NUT (2)
6 - SETSCREW (2)
7 - SCREW (2)
8 - WASHER (2)
9 - WASHER (2)
10 - BRACKET ASSEMBLY
11 - NUT (2)
12 - NUT (2)
13 - SETSCREW (2)
14 - BRACKET
1
2
3
10
14
11
12
13
9
8
7
6
5
4
TORQUE BOTH SCREWS 50-55 FT. LBS. AFTER BORESIGHTING

WE 67907

Figure 4-26. Disassembly / assembly of machine gun bracket assembly.

f. Blasting Machine Assembly and Mounting Parts. **Refer to figure 4-27.**

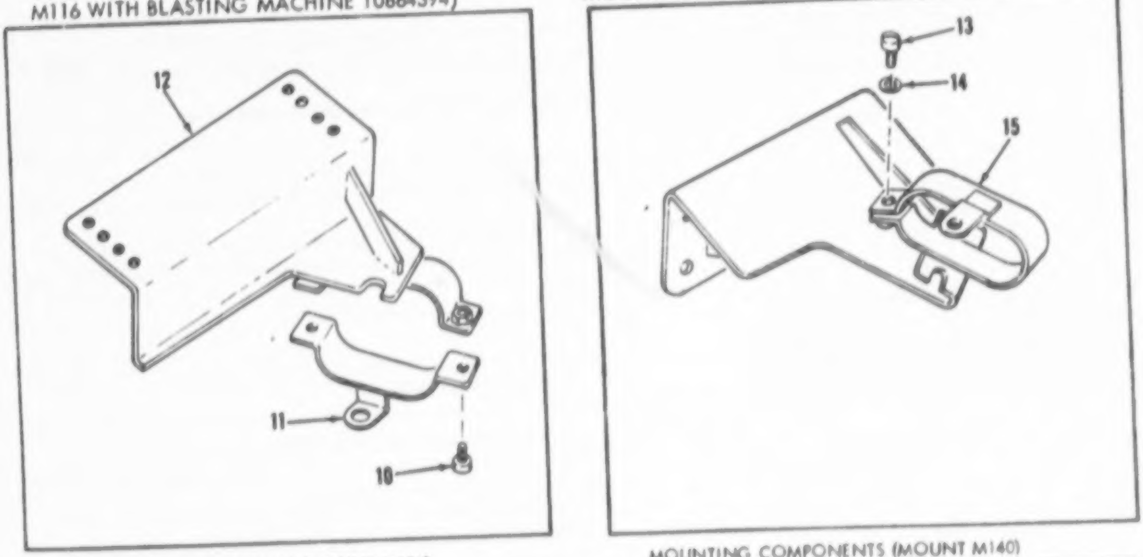
NOTE: FOLLOW NUMERIC SEQUENCE FOR DISASSEMBLY. REVERSE SEQUENCE FOR ASSEMBLY.



NOTE: NO PARTS AUTHORIZED FOR THIS BLASTING MACHINE ASSEMBLY

BLASTING MACHINE ASSEMBLY (MOUNT M116 WITH BLASTING MACHINE 10884394)

SAFETY SWITCH AND HARNESS - (MOUNT M140 AND MOUNT M116 WITH BLASTING MACHINE 11599606)



MOUNTING COMPONENTS (MOUNT M116)

MOUNTING COMPONENTS (MOUNT M140)

1 - BLASTING MACHINE ASSEMBLY
2 - PIN
3 - HANDLE ASSEMBLY
4 - INSULATOR (2)
5 - TERMINAL (2)
6 - SHELL (2)
7 - WIRE
8 - BLASTING MACHINE
9 - BLASTING MACHINE ASSEMBLY
10 - BOLT (2)
11 - STRAP ASSEMBLY
12 - BRACKET ASSEMBLY
13 - SCREW
14 - WASHER
15 - SUPPORT

WE 75108

Figure 4-27. Disassembly/assembly of blasting machine assembly and mounting parts.

4-7. Inspection and Repair

Refer to tables 10 and 11.

Table 10. Inspection of Replenisher Assembly

Fig.	Item	Component	Serviceability criteria
4-16	13	Valve assembly	Replace valve assembly if leakage is evident after pressure testing at 15 psi with OHT oil (from spring end).
4-17	23, 35	Head, Cap	Threads not damaged.
4-17	24	Spring	No corrosion or cracks. Must not have set which will interfere with proper functioning.
4-17	30	Tape	Not broken or deformed.
4-17	32	Piston	Surface free of scores, scratches, and raised metal. Seal grooves permit proper seal installation.
4-17	36	Cylinder	Threads not damaged. Plating of inside diameter of cylinder free of corrosion and raised surfaces.

Table 11. Inspection of Miscellaneous Mount Components

Fig.	Item	Component	Serviceability criteria
2-5.1	58, 63	Relay switch	Check functional operation by using firing circuit tester.
2-5.1	53, 61.1	Electrical lead	Insulation unbroken. Electrical fittings complete and functional.
2-5.2	64.5	Gunner's guard	
2-6	70		Permits free cannon movement. All welds intact.
2-4	24	Loader's guard	
2-5	33		
2-6	76	Support bracket	Capable of being fitted and installed properly.
2-6	85		
2-9	101	Trunnion caps	Surfaces that mate with trunnion seats free of deformities. Dust shield grooves capable of retaining shields. (Mount M140 only).
2-10	106	Bearings	Inspect in accordance with TM 9-214.
2-10	111		
4-23	13	Torque bracket	Secures to gun mount properly. No raised obstructions in breech mechanism key slot.
4-16	8	Hose	Replace if hose has swelling, breaks, or abrasions deep enough to show inner fabric or evidence of any leakage.
4-21	2, 7	Shield	Casting and machined areas free of cracks, breaks, and deformities.
4-25	5	Shield	Not torn or detached from support.
4-25	15	Support	Not broken or distorted.
4-25	16	Bracket assembly	Capable of securing machine gun. Boresighting adjusting screws functional.
4-27	1, 9	Blasting machine	Handle pins securely to blasting machine. Cable insulation unbroken. Electrical connectors capable of attachment to mating connectors. Using firing circuit tester, perform functional test of electrical output by sharp rotation of handle.

Section IV. REPAIR OF RECOIL MECHANISM

4-8. Disassembly/Assembly

Refer to figures 4-28 through 4-35.

NOTE

Items 27, 29, 31, figure 4-31 item 38, figure 4-32, and items 41, 43, figure 4-33 (contained in REPAIR KIT 1015-169-1785) must be replaced each time recoil mechanism is disassembled. See figures 4-33.1 and 4-33.2 for locational guides when installing seal assemblies.

4-8.1. Special Machining of Tube Support Sleeve and Recoil Piston Assembly

NOTE

Whenever mount is disassembled for repair by general support maintenance, check part number of tube support sleeve and piston assembly. If sleeve has part number 8762794 and piston assembly has part number 10915951, modification procedure below must be applied. If sleeve reflects part number 11658912, check rear bearing surface to verify dimensions cited in figure 4-36 and modify if necessary. If sleeve complies with cited dimensional requirements, metal stamp "A" after part number. Part number 11658913 on piston assembly indicates it already has been modified. Part numbers 8449036 and 8449037, respectively, indicate they are of new design and do not require modification.

a. *Machining Tube Support Sleeve.*

(1) Place sleeve in lathe (16-inch or above) using four jaw chuck and a steadyrest on centering plate (fig. 1-7) as desired.

(2) Use dial indicator at points specified in figure 4-36 to insure trueness.

(3) Turn outside diameter of the three indicated bearing surfaces (fig. 4-36) to 10.860±0.005-inch with 63 microinch surface. The cutting tool shown in figure 4-36 is recommended with lathe speed of 147 rpm and feed 0.0036-inch.

(4) Gage desired finish by comparing outer bearing surface.

(5) Chamfer bearing surface as shown in DETAIL A, figure 4-36.

(6) After machining tube support sleeve, obliterate old part number 8762794 and metal stamp new part number 11658912A on sleeve.

b. *Machining Piston Assembly.*

(1) Place piston in lathe using a four jaw chuck and a steadyrest.

(2) Indicate trueness of piston with dial indicator at locations shown in figure 4-36.

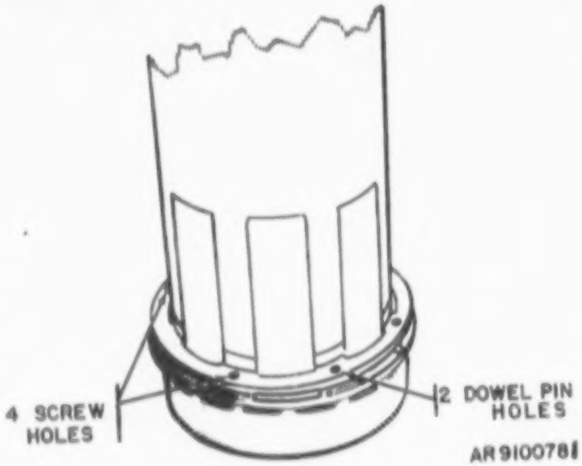
(3) Machine piston, cutting a 7° chamfer as illustrated in DETAIL B, figure 4-36.

(4) Break sharp edge at point indicated in DETAIL B.

(5) After machining recoil piston assembly obliterate old part number 10915951 and metal stamp new part number 11658913.

4-8.2. Special Dowel Pin Application Instructions

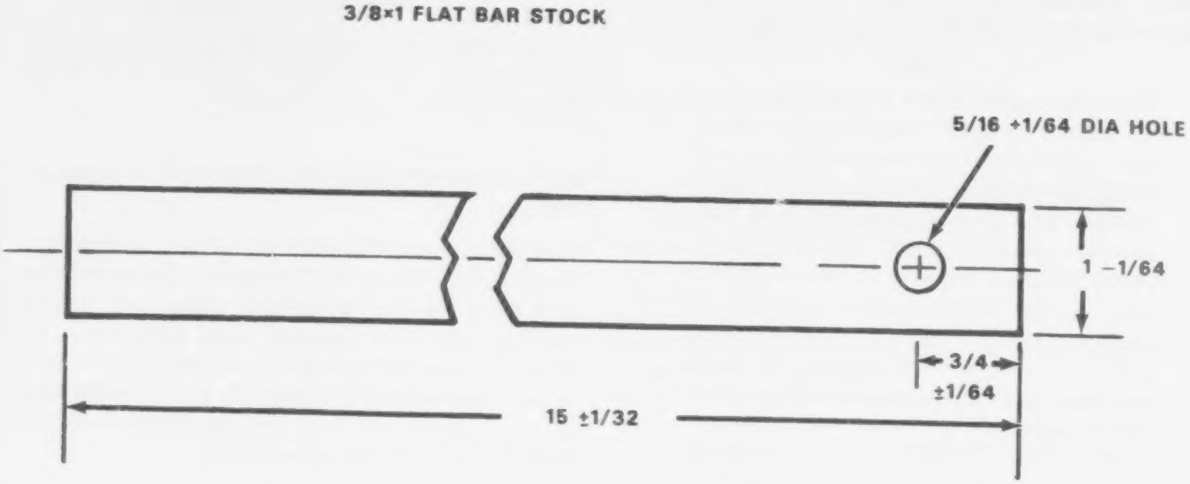
Whenever mount is disassembled, check assembly of ring, PN 8370368 to piston assembly. Two dowel pins, in addition to the four screws, must be used for retention purposes (fig. 4-27.1). If unmodified, the following mandatory application instructions must be complied with. Dowel pins have been established as a set (2 ea) and may be requisitioned by PN 8449259. NSN 1015-00-127-4451.



AR9100781

Figure 4-27.1. Dowel pin locations.

a. *Fixture Fabrication Instructions.* Fabricate upper guide plate (fig 4-27.2), drill extension, and split bushing (fig 4-27.3) in accordance with defined dimensional configuration. One each, 25/64-inch drill and 13/32-inch reamer will be required for dowel pin application.


3/8×1 FLAT BAR STOCK
5/16 +1/64 DIA HOLE
1 -1/64
3/4
±1/64
15 ±1/32

AR 910067

Figure 4-27.2. Fabricated upper guide plate.

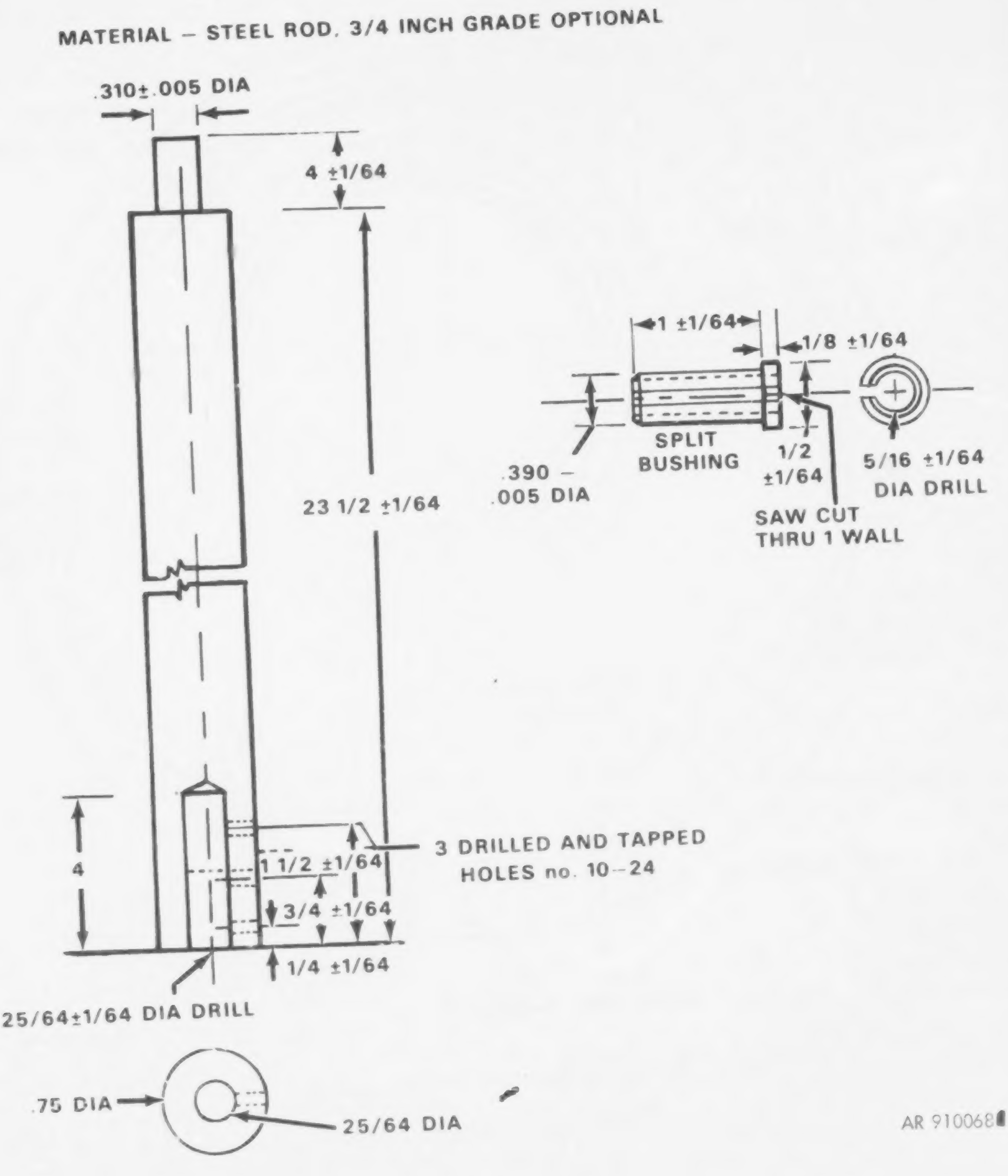

MATERIAL — STEEL ROD, 3/4 INCH GRADE OPTIONAL
.310±.005 DIA
4 ±1/64
23 1/2 ±1/64
4
1 1/2 ±1/64
3/4 ±1/64
1/4 ±1/64
3 DRILLED AND TAPPED HOLES no. 10–24
25/64±1/64 DIA DRILL
.75 DIA
25/64 DIA
1 ±1/64
1/8 ±1/64
.390 – .005 DIA
SPLIT BUSHING
1/2 ±1/64
5/16 ±1/64 DIA DRILL
SAW CUT THRU 1 WALL
AR 910068

Figure 4-27.3. Fabricated drill extension and split bushing.

b. Application Instructions.

(1) Drill two 25/64-inch holes in ring, PN 8370368. (See fig 4-27.4 for precise locations.) Remove burrs.

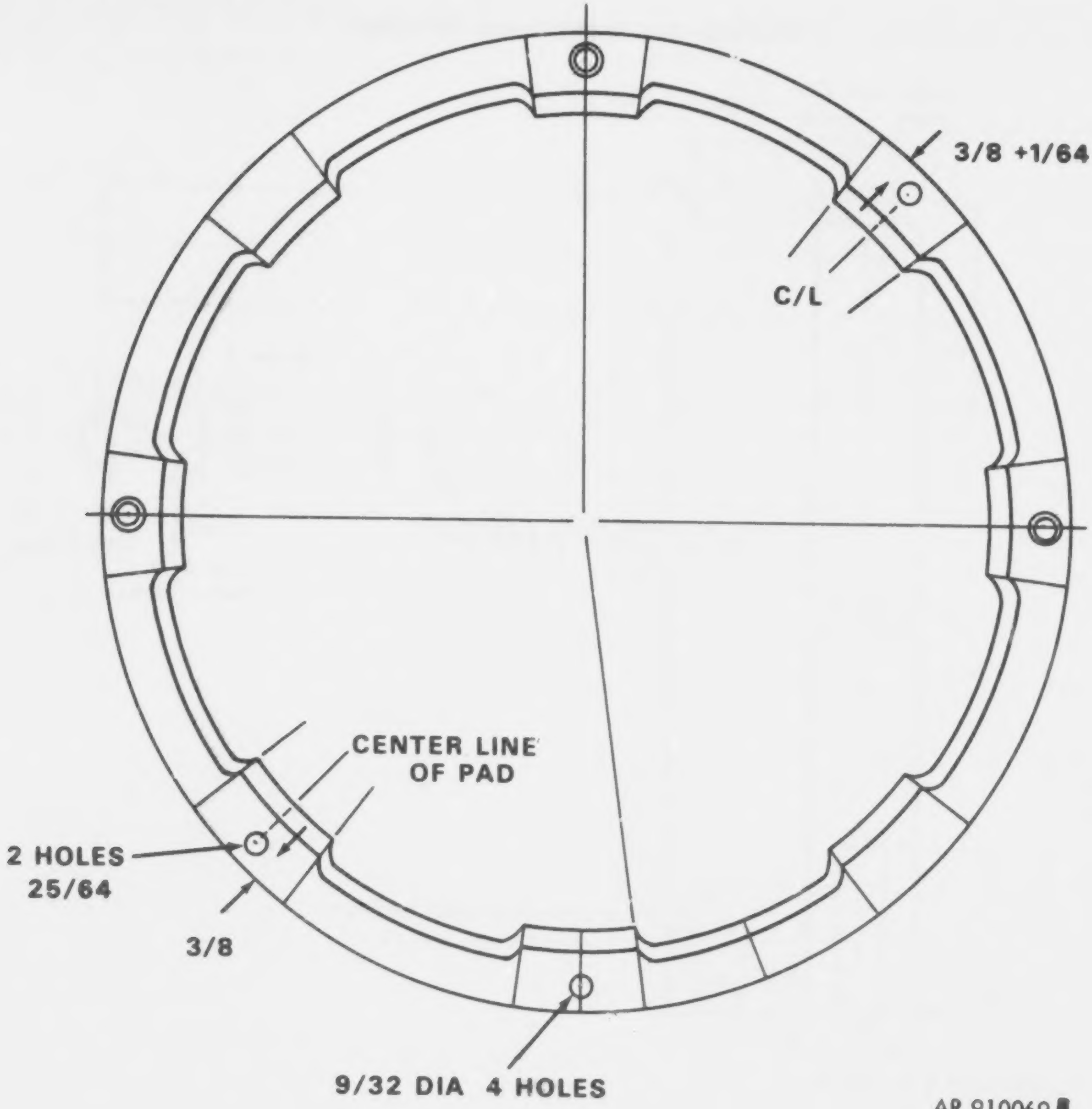

3/8 +1/64
C/L
CENTER LINE
OF PAD
2 HOLES
25/64
3/8
9/32 DIA 4 HOLES
AR 910069

Figure 4-27.4. Location of holes in ring.

(2) Assemble ring to piston assembly (fig 4-32). Secure with the four authorized screws, NSN 5305-00-989-0502 (mandatory replacement). Torque 13 to 15 lb ft.

(3) Assemble adapter to piston assembly. Screw the adapter onto the piston so base of adapter slot is flush with end of piston assembly (fig 4-27.5). Additional adjustment may be required during succeeding step.

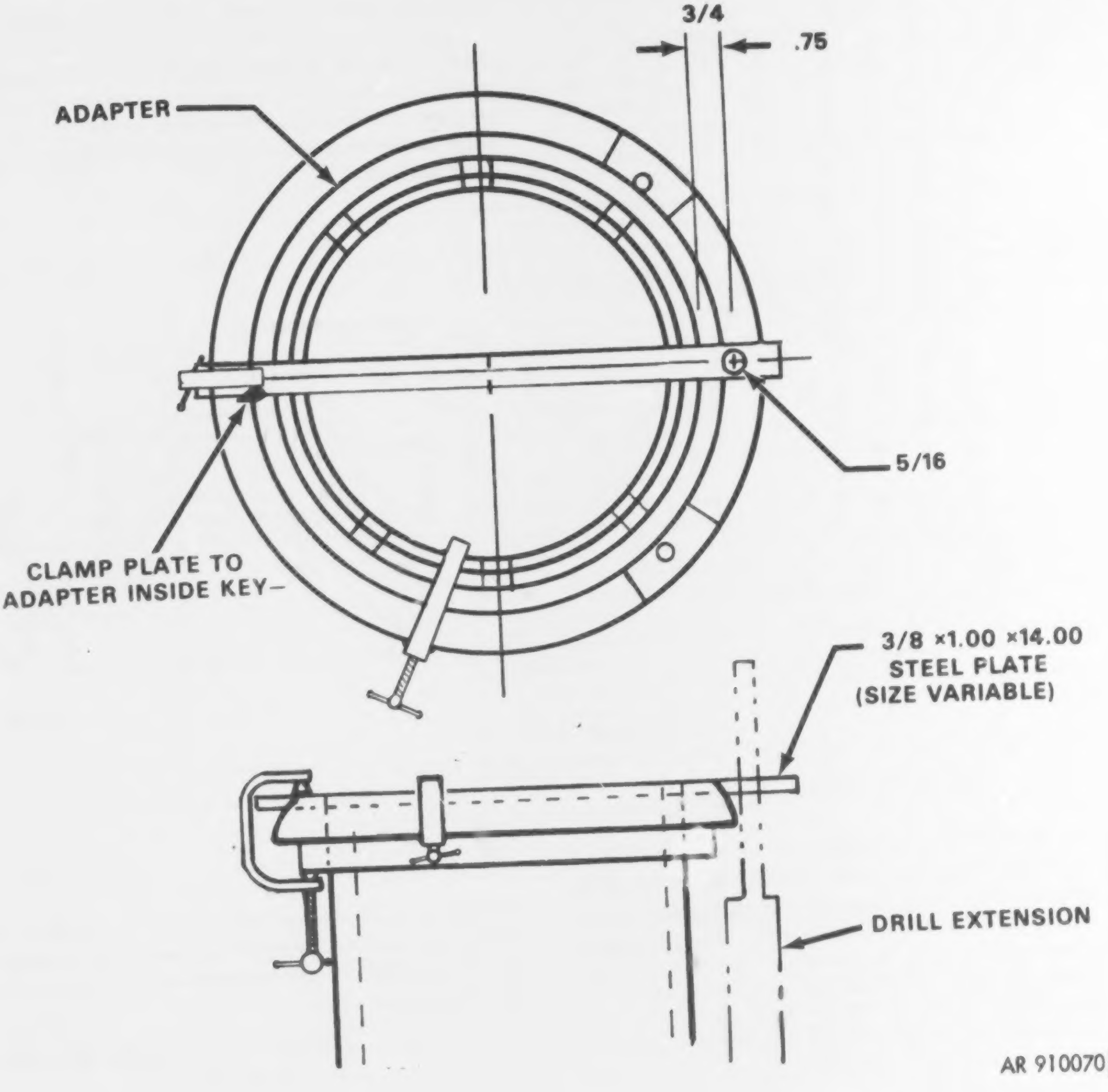
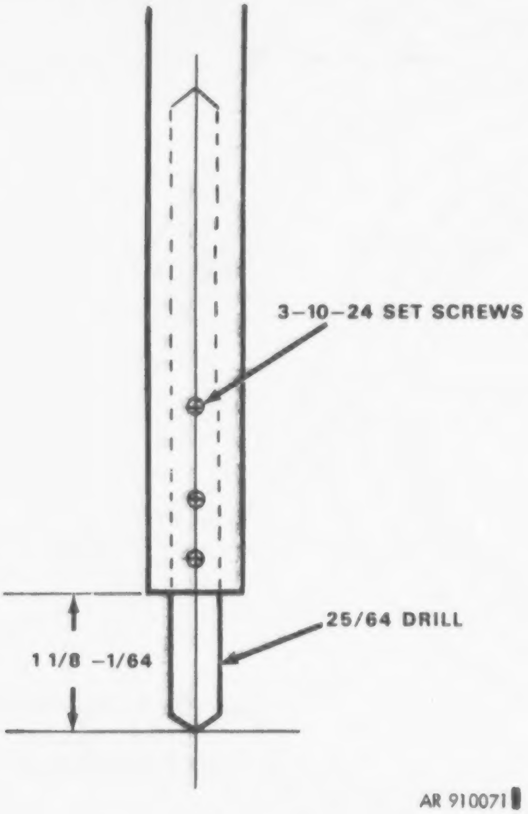

3/4
.75
ADAPTER
5/16
CLAMP PLATE TO
ADAPTER INSIDE KEY
3/8 ×1.00 ×14.00
STEEL PLATE
(SIZE VARIABLE)
DRILL EXTENSION
AR 910070

Figure 4-27.5. Location of adapter on piston assembly.

(4) Place 25/64-inch drill in fabricated drill extension. Drill must not extend beyond 1 1/8 inches from face of extension (fig 4-27.6). Firmly tighten retaining screws.



AR 910071

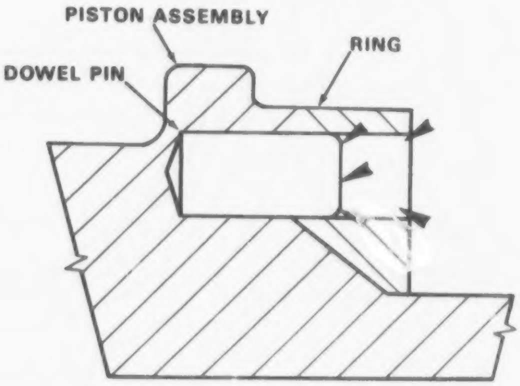
Figure 4-27.6. Drill extension location.

(5) In order to attain proper vertical positioning, place drill in predrilled 25/64-inch hole (ring), place end of drill extension in guide plate hole and position guide plate within adapter slots. Slight adapter readjustment may be necessary for proper alignment. The upper (5/16-inch diameter) segment of the drill extension may barely contact the outside surface of the adapter. When prescribed positioning has been attained, place "C" clamps in designated locations (fig 4-27.5).

(6) Utilizing a 3/8-inch drill (with attachable handle;, drill the two 25/64-inch holes in piston assembly to maximum depth (1 1/8 inches). Lubricate frequently. Drill must be removed for chip removal. Fixture relocation will be necessary to drill second hole.

(7) Remove fixtures from piston assembly. Replace drill with 13/32-inch reamer and bushing. Reassemble fixtures consistent with requirements outlined in paragraph (5) above. Ream the two 25/64-inch holes, full depth. Lubricate frequently.

(8) Thoroughly clean reamed hole and insert two dowel pins, PN 8449259. See fig 4-27.7 for staking locations. Dowel pins must be positively staked to prevent possible dislocation. Use center punch for internal staking and chisel for staking externally (ring surface).



AR 910072

Figure 4-27.7. Staking location.

(9) If replacement of ring, PN 8370368, is necessary, utilize pads 90° opposite from those previously drilled in piston assembly for initial dowel pin application.

(10) Repeat all steps beginning with paragraph (3) above, for second application.

(11) Replacement of ring in excess of the two times outlined above will require replacement of complete adapter and piston assembly. Return assembly through normal supply channels.

(12) Annotate the following remark on the 2408-4 and 2408-5 cards: "Dowel Pins Applied (Piston Assembly)."

4-9. Inspection and Repair

Refer to table 12.

Table 12. Inspection of Recoil Mechanism Assembly

Fig	Item	Component	Serviceability criteria
4-30	14	Adapter	Free of cracks.
4-30	15	Collar	Not cracked or broken.
4-31	25	Spacer	No deformation or cracks.
4-31	26	Cover	Not cracked, chipped, or deformed.
4-31	28	Retainer	Not deformed, chipped or cracked. Machine inside diameter from 11.505 + 0.003 to 11.508 + 0.003 (fig. 4-31).
4-31	30	Seat	Grooves able to retain seals. Axial deformities of inside diameter should be removed by polishing and stoning.
4-31	32	Spring	Visually inspect for any indication of a surface crack or crack like defect. Reject all springs which have cracks that are entirely outside of or extend outside of the worn area on the spring OD. The presence of cracks in the worn area on the spring OD is normal. See figure 4-31.1.
4-32	33	Ring	Must meet following specifications: *a.* Rockwell hardness C48 to C52. *b.* 0.205- to 0.207-inch thickness. *c.* Rings not distorted or damaged. *d.* Ring returns freely to 10 61/64 minus 1/8-inch inside diameter when expanded sufficiently for assembly to piston.
4-32	35	Ring	Not cracked or deformed.
4-32	36	Valve	Not cracked, broken, or worn to the extent of functioning improperly.
4-32	37	Piston assembly	Machined working surfaces free of scoring, galling, and etching. Scoring and galling may be reduced by honing or use of fine stones. Etching sufficient to cause oil leakage at static rest position is cause for replacement. Check for part number. If 10915951 appears, machine piston assembly (para 4-8.1).
4-33	42	Sleeve	Sleeve bore and external surfaces not scored. Reduce raised metal on outside diameter working surface to a minimum using crocus cloth or oil hone. Etching sufficient to cause leakage at static rest position is cause for replacement. Check for part number. If 8762794 appears, machine tube support sleeve (para 4-8.1).
4-33	44	Cradle	Reduce raised metal to a minimum with crocus cloth or oil hone. All welds in tact.

4-10. Testing

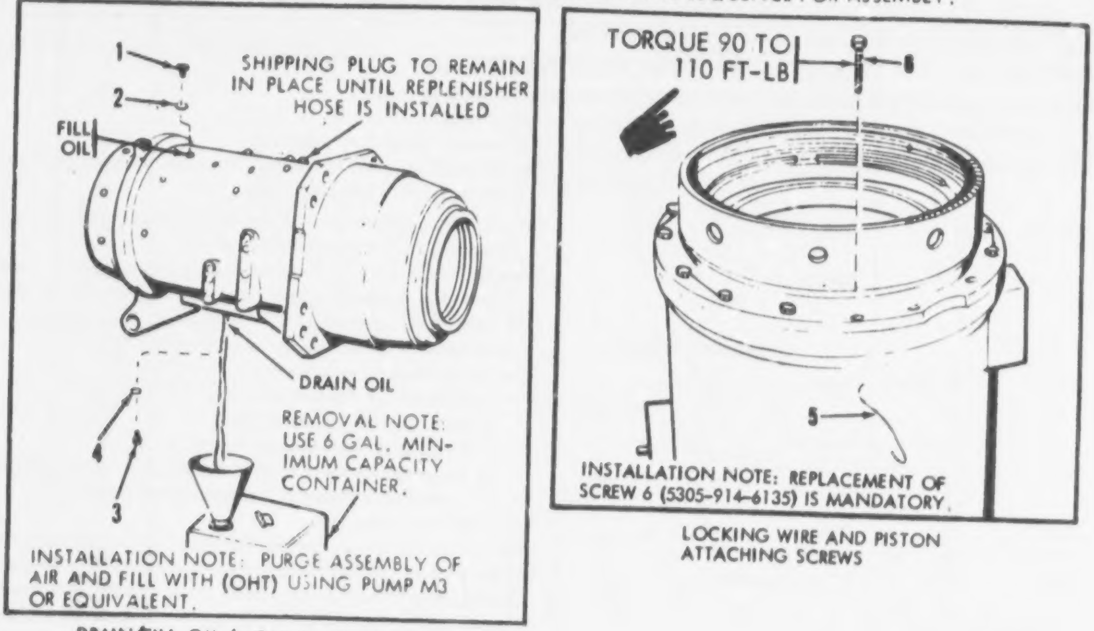
a. Conduct a pressure leak test with cannon installed in recoil mechanism (figs. 4-37 and 4-38). Test must be performed with cannon installed in support sleeve recess and attached to recoil piston (fig. 3-3) to prevent damage to recoil components from test pressures.

b. Recoil cylinder must meet prescribed test standards as outlined in figures 4-37 and 4-38.

4-11. Exercising Recoil Mechanism and Replenisher

Recoil mechanism and replenisher are to be exercised jointly at intervals not to exceed 6 months. Refer to TB 9-1000-234-35 for methods for exercising.

NOTE: FOLLOW NUMERIC SEQUENCE FOR DISASSEMBLY. REVERSE SEQUENCE FOR ASSEMBLY.



SHIPPING PLUG TO REMAIN IN PLACE UNTIL REPLENISHER HOSE IS INSTALLED

REMOVAL NOTE: USE 6 GAL. MINIMUM CAPACITY CONTAINER.

INSTALLATION NOTE: PURGE ASSEMBLY OF AIR AND FILL WITH (OHT) USING PUMP M3 OR EQUIVALENT.

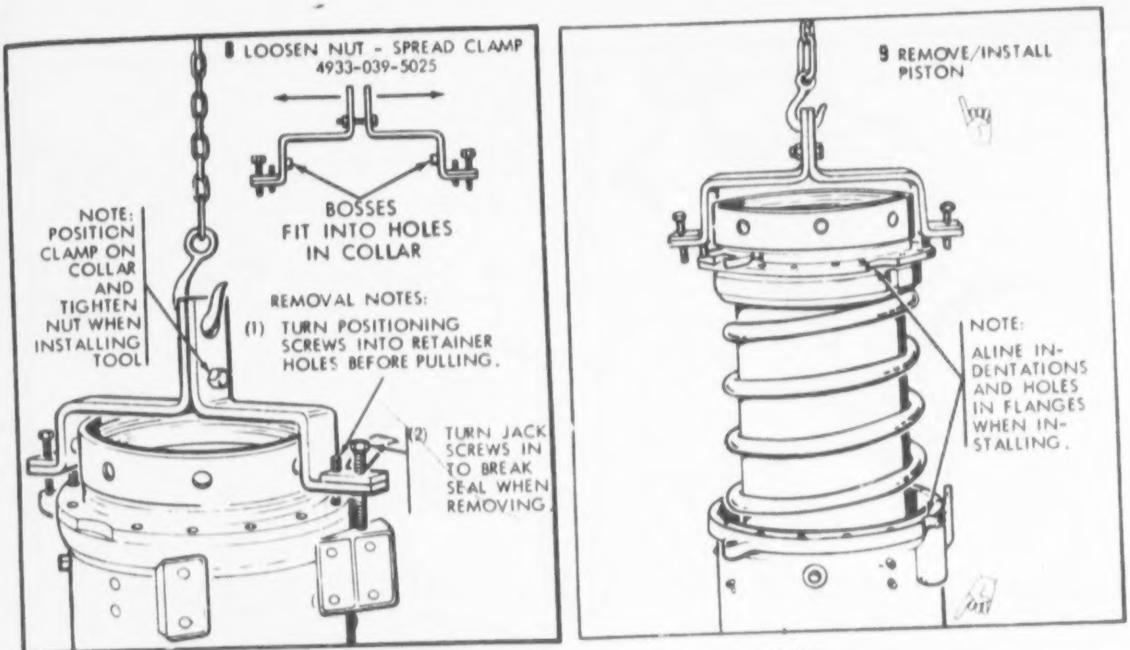
DRAIN/FILL OIL (MOUNT M116 SHOWN)

INSTALLATION NOTE: REPLACEMENT OF SCREW 6 (5305-914-6135) IS MANDATORY.

LOCKING WIRE AND PISTON ATTACHING SCREWS

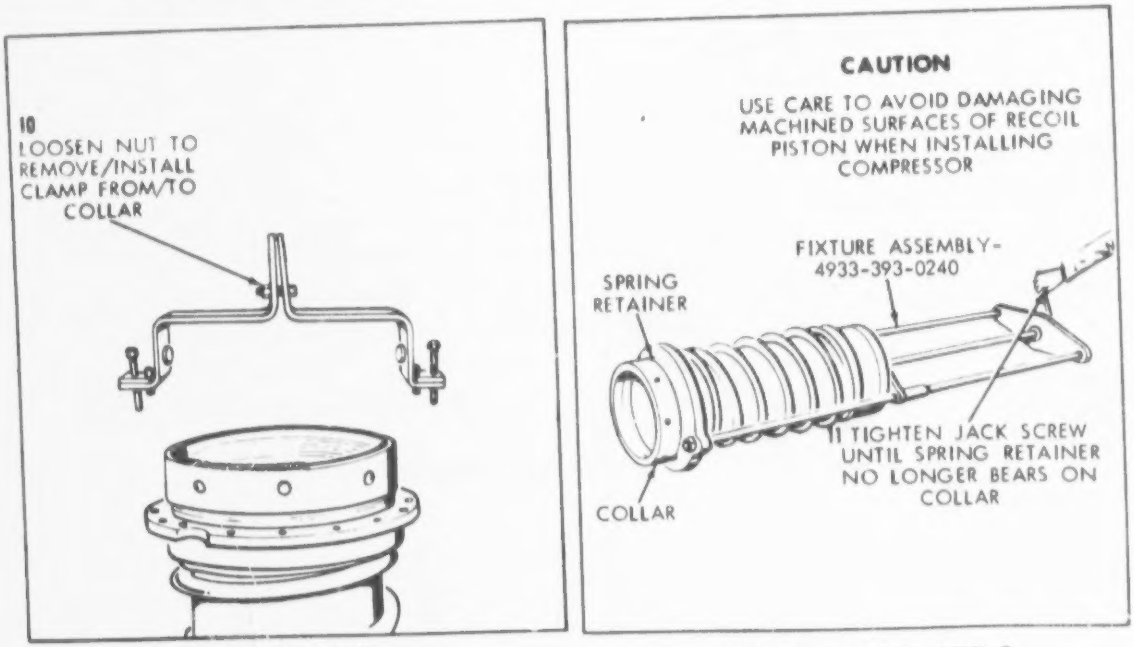
1	PLUG	7037928
2	WASHER	5168608
3	PLUG	7037928
4	WASHER	5168098
5	WIRE	QQ-W-461
6	SCREW	MS18153-114 (10)

Figure 4-28. Disassembly/assembly of recoil mechanism (1 of 6).


8 LOOSEN NUT - SPREAD CLAMP
4933-039-5025
BOSSES FIT INTO HOLES IN COLLAR
NOTE: POSITION CLAMP ON COLLAR AND TIGHTEN NUT WHEN INSTALLING TOOL
REMOVAL NOTES:
(1) TURN POSITIONING SCREWS INTO RETAINER HOLES BEFORE PULLING.
(2) TURN JACK SCREWS IN TO BREAK SEAL WHEN REMOVING.
9 REMOVE/INSTALL PISTON
NOTE: ALINE INDENTATIONS AND HOLES IN FLANGES WHEN INSTALLING.

LIFTING CLAMP AND HOIST

PISTON

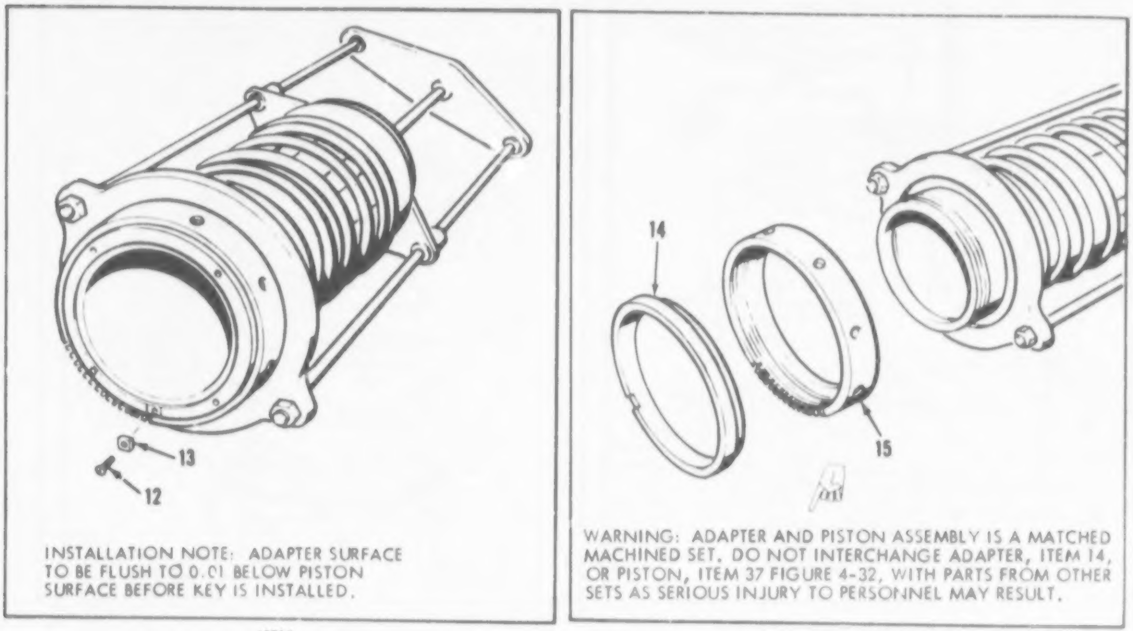

10 LOOSEN NUT TO REMOVE/INSTALL CLAMP FROM/TO COLLAR
CAUTION
USE CARE TO AVOID DAMAGING MACHINED SURFACES OF RECOIL PISTON WHEN INSTALLING COMPRESSOR
FIXTURE ASSEMBLY- 4933-393-0240
SPRING RETAINER
11 TIGHTEN JACK SCREW UNTIL SPRING RETAINER NO LONGER BEARS ON COLLAR
COLLAR

LIFTING CLAMP

COMPRESSING RECOIL SPRING

WE 75145

Figure 4-29. Disassembly/assembly of recoil mechanism (2 of 6).

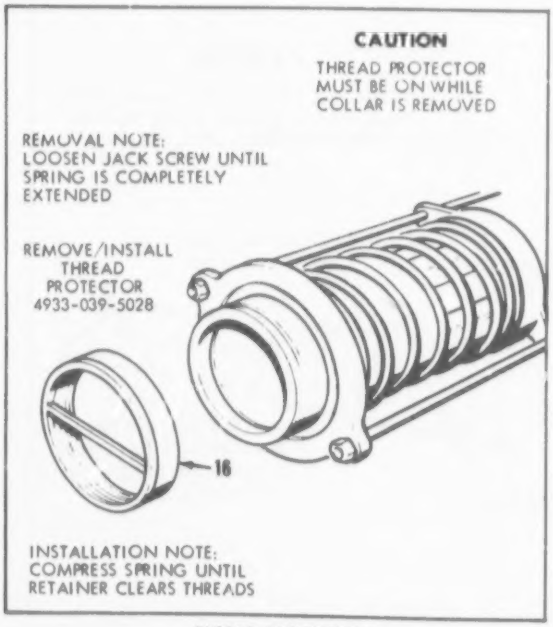


INSTALLATION NOTE: ADAPTER SURFACE TO BE FLUSH TO 0.01 BELOW PISTON SURFACE BEFORE KEY IS INSTALLED.

WARNING: ADAPTER AND PISTON ASSEMBLY IS A MATCHED MACHINED SET. DO NOT INTERCHANGE ADAPTER, ITEM 14, OR PISTON, ITEM 37 FIGURE 4-32, WITH PARTS FROM OTHER SETS AS SERIOUS INJURY TO PERSONNEL MAY RESULT.

KEY

COLLAR AND ADAPTER



CAUTION

THREAD PROTECTOR MUST BE ON WHILE COLLAR IS REMOVED

REMOVAL NOTE:
LOOSEN JACK SCREW UNTIL SPRING IS COMPLETELY EXTENDED

REMOVE/INSTALL THREAD PROTECTOR 4933-039-5028

INSTALLATION NOTE:
COMPRESS SPRING UNTIL RETAINER CLEARS THREADS

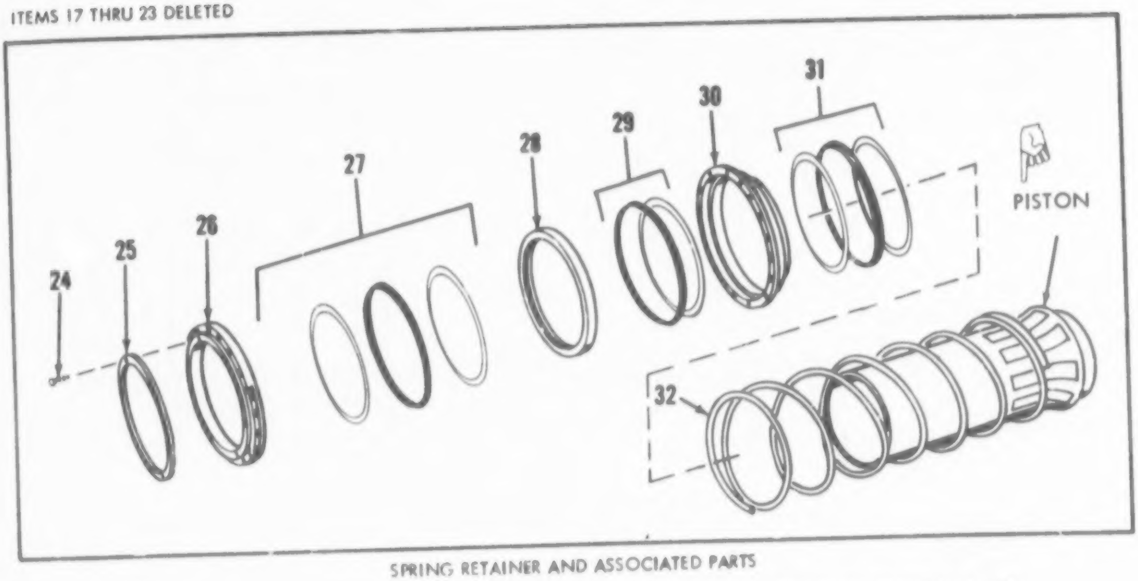
THREAD PROTECTOR

12 - SCREW
13 - KEY
14 - ADAPTER (PART OF ADAPTER AND PISTON ASSEMBLY 5911170)
15 - COLLAR

Figure 4-30. Disassembly/assembly of recoil mechanism (3 of 6).

WE 75146

ITEMS 17 THRU 23 DELETED



SPRING RETAINER AND ASSOCIATED PARTS

INSTALLATION NOTES:

1. BEFORE ASSEMBLY APPLY AIRCRAFT GREASE, FSN 9150-944-8953 (MIL-G-81322) TO ALL SEALS IN KIT.
2. MACHINE RETAINER (28) P/N 10884029 INSIDE DIAMETER FROM 11.505 +0.083 TO 11.508 +0.003.
3. POSITION SPRING SO THAT PORTION DISPLAYING MOST WEAR IS LOCATED AT BREECH END OF GUN MOUNT.

24 - SCREW MS35190-289 (6)
25 - SPACER 10884027
26 - COVER 10884030
27 - SEAL ASSEMBLY 8449043
28 - RETAINER 10884029
29 - SEAL ASSEMBLY 8448927
30 - SEAT 10887160
31 - SEAL ASSEMBLY 8448928
32 - SPRING 11645637

WE 75106

Figure 4-31. Disassembly/assembly of recoil mechanism (4 of 6).

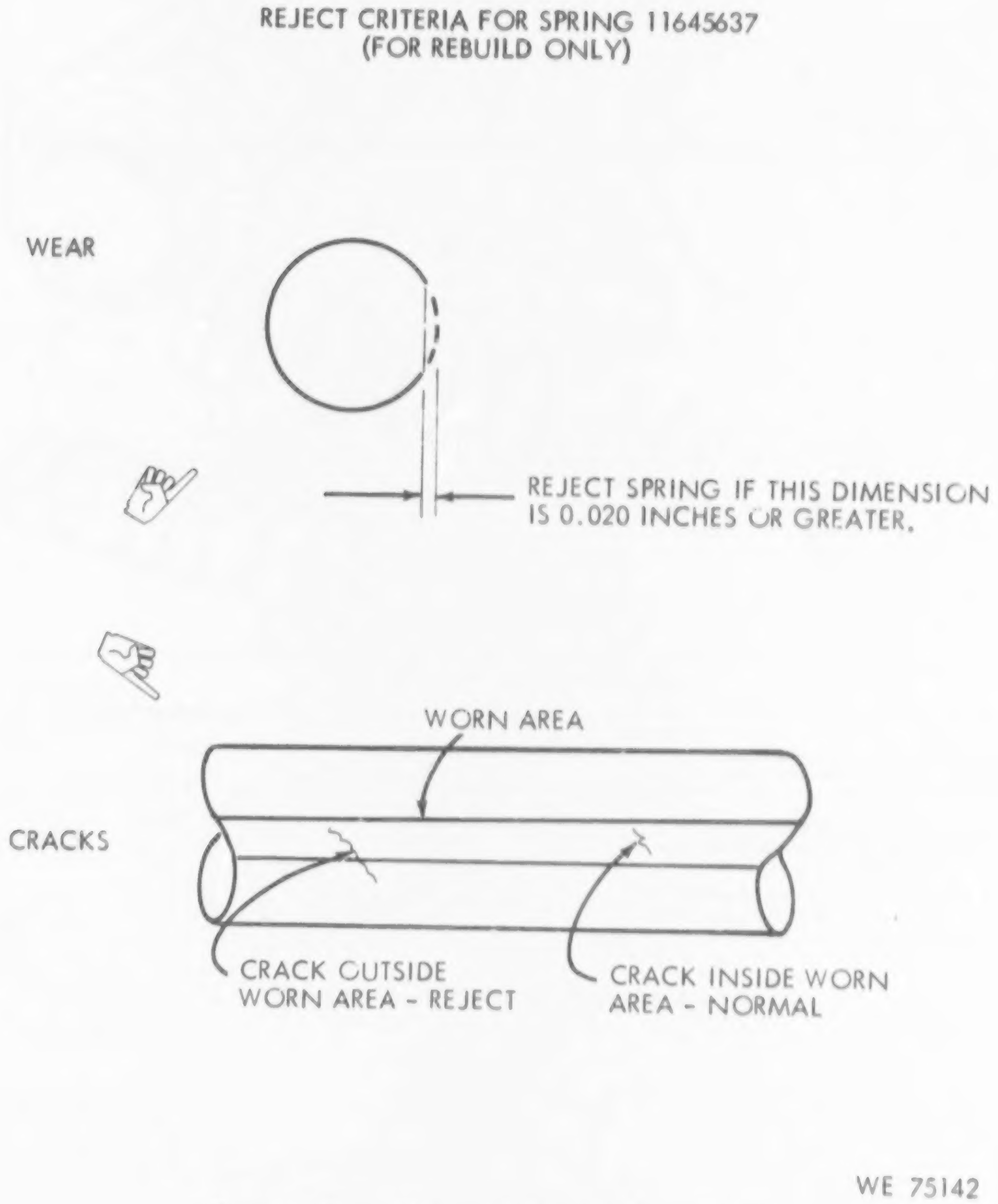
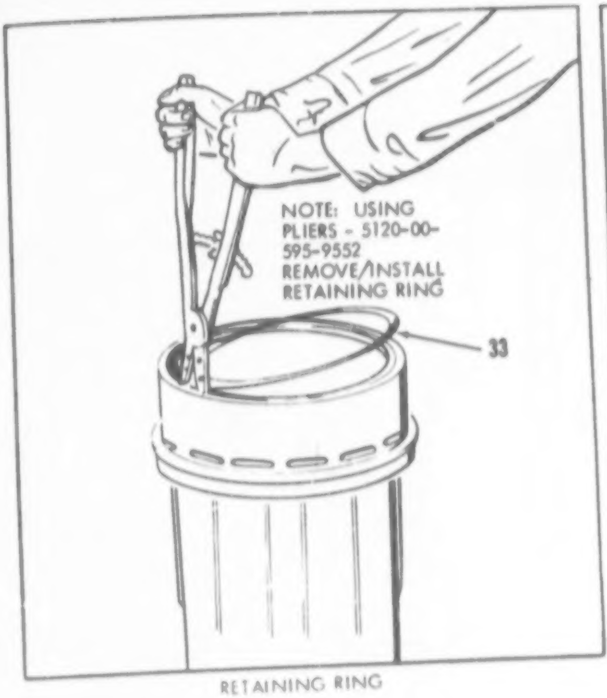
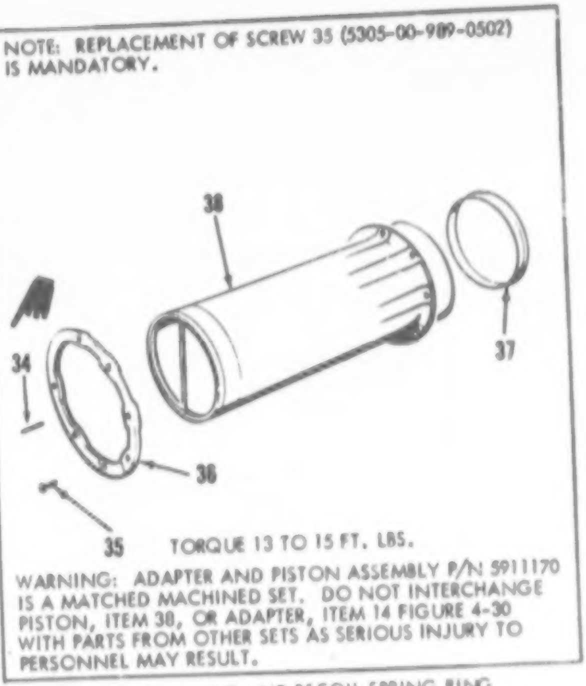

REJECT CRITERIA FOR SPRING 11645637
(FOR REBUILD ONLY)
WEAR
REJECT SPRING IF THIS DIMENSION IS 0.020 INCHES OR GREATER.
WORN AREA
CRACKS
CRACK OUTSIDE WORN AREA - REJECT
CRACK INSIDE WORN AREA - NORMAL
WE 75142

Figure 4-31.1. Disassembly/assembly of recoil mechanism (4.1 of 6).


NOTE: USING
PLIERS - 5120-00-
595-9552
REMOVE/INSTALL
RETAINING RING
33

RETAINING RING

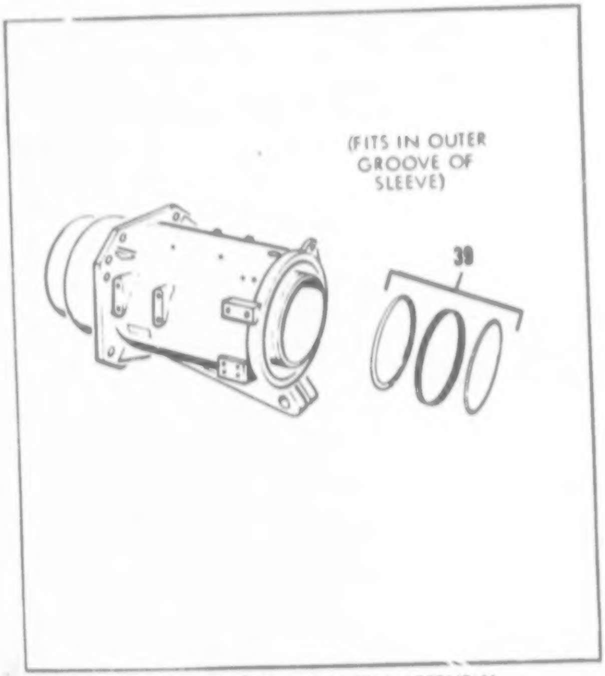

38
37
34
36
35

NOTE: REPLACEMENT OF SCREW 35 (5305-00-989-0502) IS MANDATORY.

TORQUE 13 TO 15 FT. LBS.

WARNING: ADAPTER AND PISTON ASSEMBLY P/N 5911170 IS A MATCHED MACHINED SET. DO NOT INTERCHANGE PISTON, ITEM 38, OR ADAPTER, ITEM 14 FIGURE 4-30 WITH PARTS FROM OTHER SETS AS SERIOUS INJURY TO PERSONNEL MAY RESULT.

INERTIA VALVE AND RECOIL SPRING RING

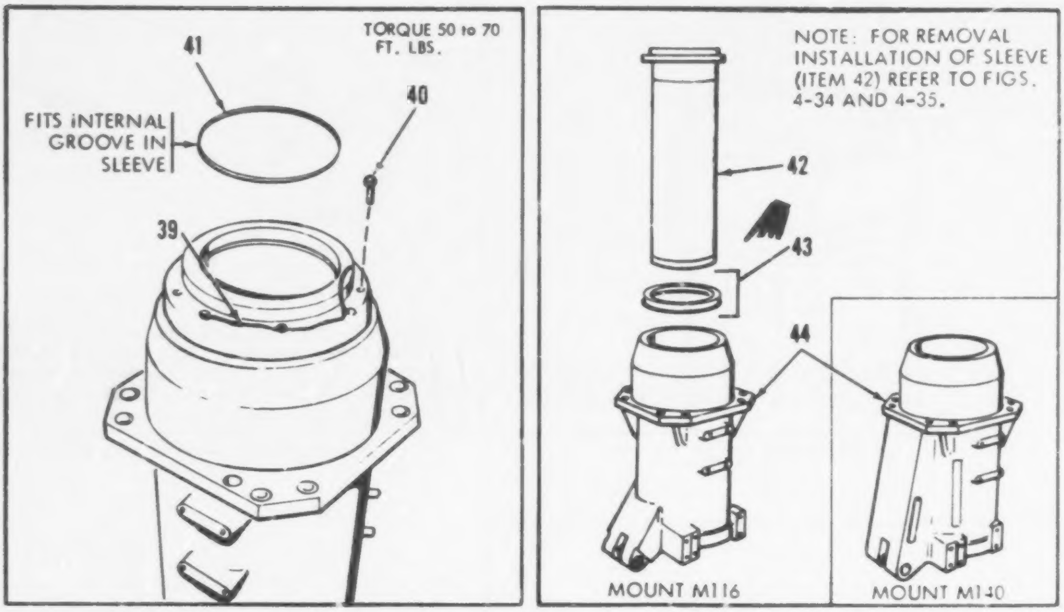

(FITS IN OUTER
GROOVE OF
SLEEVE)
39

GUN TUBE SUPPORT SLEEVE SEAL ASSEMBLY
(MOUNT M116 SHOWN)

33. RING 8716265
34. PIN 8449529
35. SCREW MS21262-44 (4)
36. RING 8370368
37. VALVE 8364199
38. PISTON (PART OF ADAPTER AND PISTON ASSEMBLY 5911170)
39. SEAL ASSEMBLY 8449044

AR 910095

Figure 4-32. Diassembly/assembly of recoil mechanism (5 of 6).


TORQUE 50 to 70 FT. LBS.
41
40
FITS INTERNAL GROOVE IN SLEEVE
39
NOTE: FOR REMOVAL INSTALLATION OF SLEEVE (ITEM 42) REFER TO FIGS. 4-34 AND 4-35.
42
43
44
MOUNT M116
MOUNT M140

QUAD RING AND SUPPORT SLEEVE ATTACHING SCREWS

SLEEVE, GASKET, AND CRADLE

WE 70204

39 Wire MS20995-F41
40 Screw MS18153-87 (8)
41 Ring 8728296
42 Sleeve 8449036
43 Seal Assembly 8448923
44 Cradle 8762957 (M60 only)
44 Cradle 10905989 (M60A1 only)

Figure 4-33. Disassembly/assembly of recoil mechanism (6 of 6).

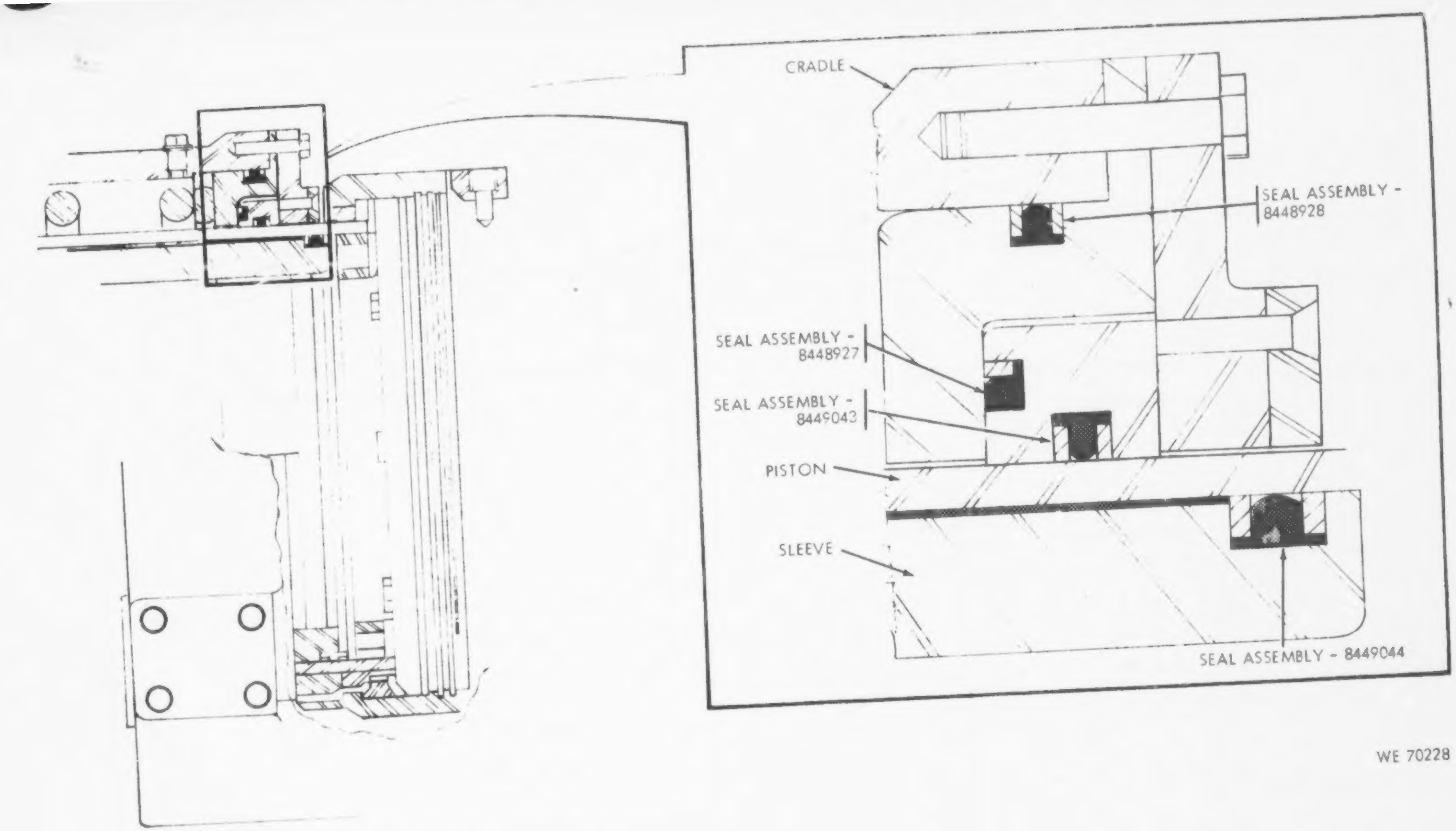

CRADLE
SEAL ASSEMBLY - 8448928
SEAL ASSEMBLY - 8448927
SEAL ASSEMBLY - 8449043
PISTON
SLEEVE
SEAL ASSEMBLY - 8449044
WE 70228

Figure 4-33.1. Assembly guide for seal assemblies—cross section (1 of 2).

best copy available

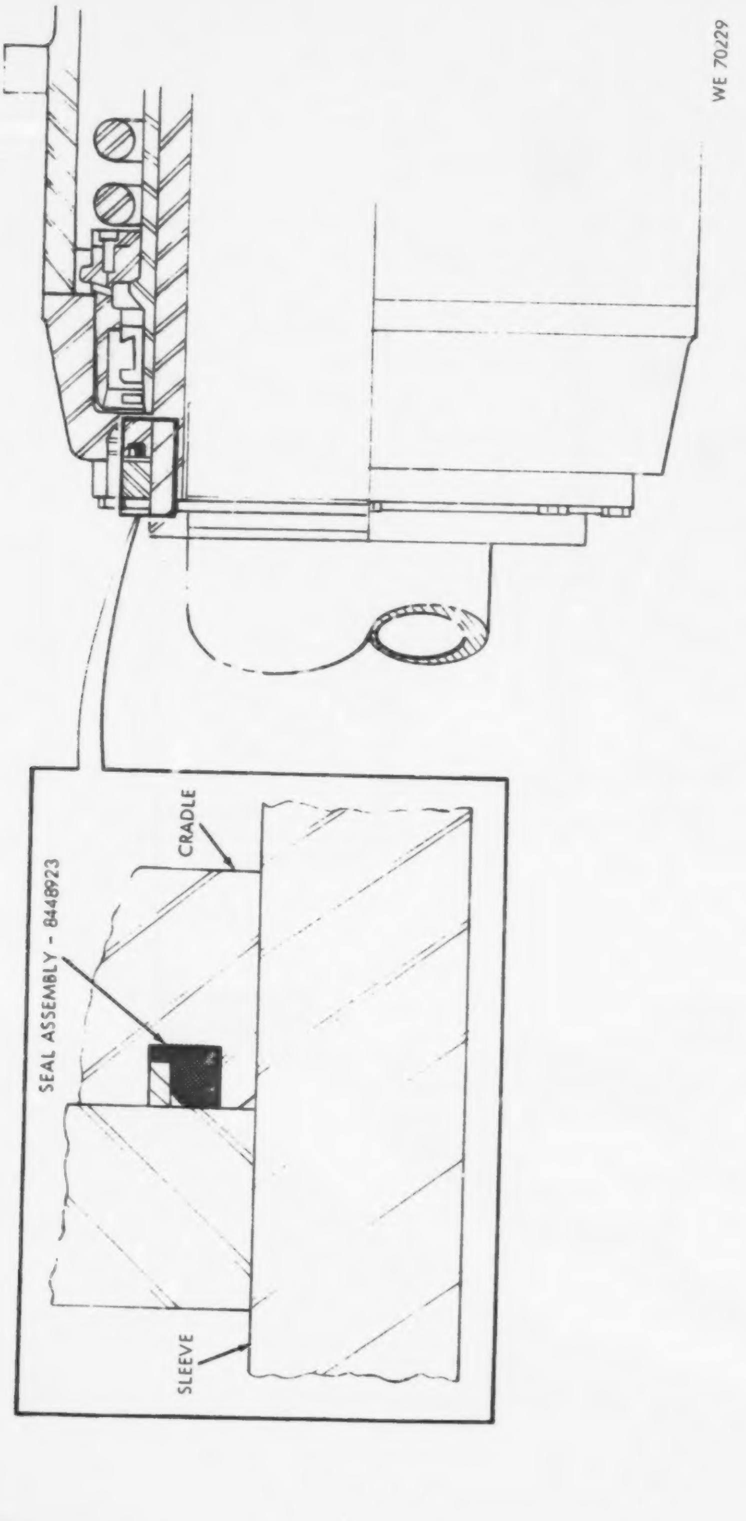
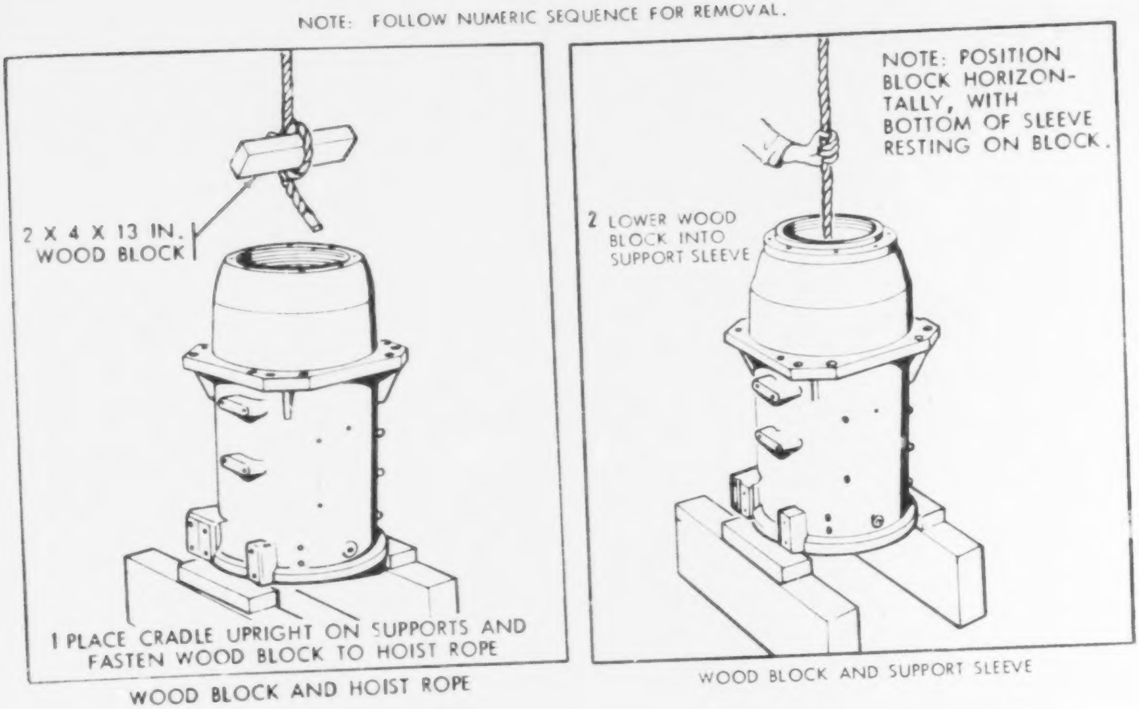

WE 70229
SEAL ASSEMBLY - 8448923
CRADLE
SLEEVE

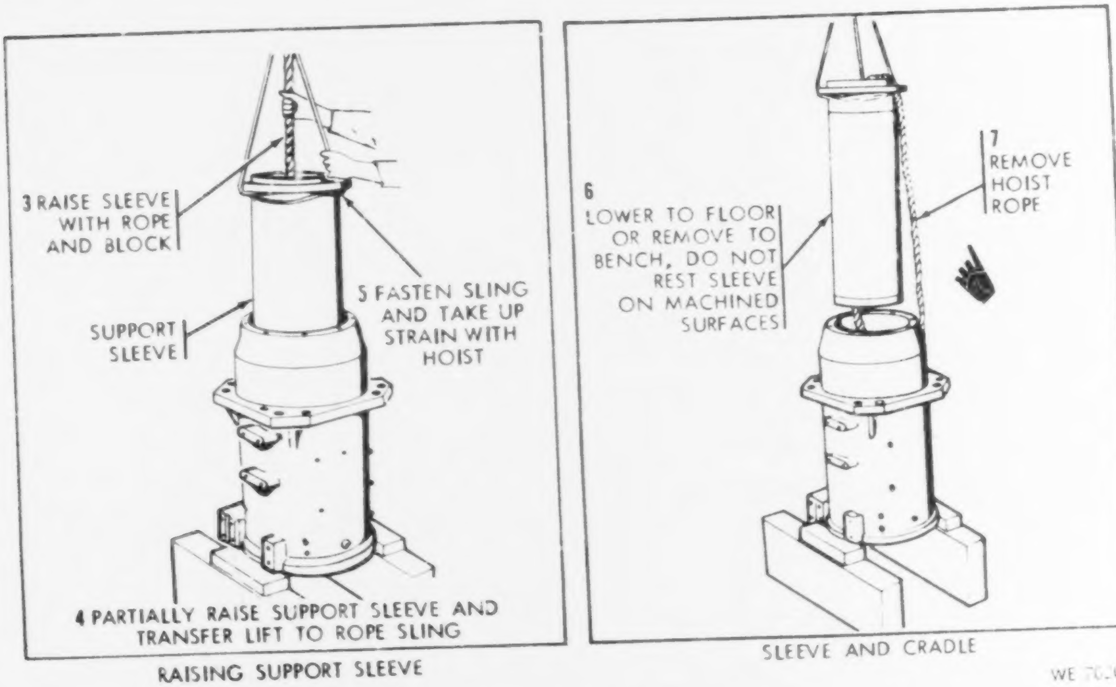
Figure 4-33.2. Assembly guide for seal assemblies—cross section (2 of 2).

NOTE: FOLLOW NUMERIC SEQUENCE FOR REMOVAL.


2 X 4 X 13 IN. WOOD BLOCK
1 PLACE CRADLE UPRIGHT ON SUPPORTS AND FASTEN WOOD BLOCK TO HOIST ROPE
NOTE: POSITION BLOCK HORIZONTALLY, WITH BOTTOM OF SLEEVE RESTING ON BLOCK.
2 LOWER WOOD BLOCK INTO SUPPORT SLEEVE

WOOD BLOCK AND HOIST ROPE

WOOD BLOCK AND SUPPORT SLEEVE


3 RAISE SLEEVE WITH ROPE AND BLOCK
SUPPORT SLEEVE
5 FASTEN SLING AND TAKE UP STRAIN WITH HOIST
4 PARTIALLY RAISE SUPPORT SLEEVE AND TRANSFER LIFT TO ROPE SLING
6 LOWER TO FLOOR OR REMOVE TO BENCH, DO NOT REST SLEEVE ON MACHINED SURFACES
7 REMOVE HOIST ROPE

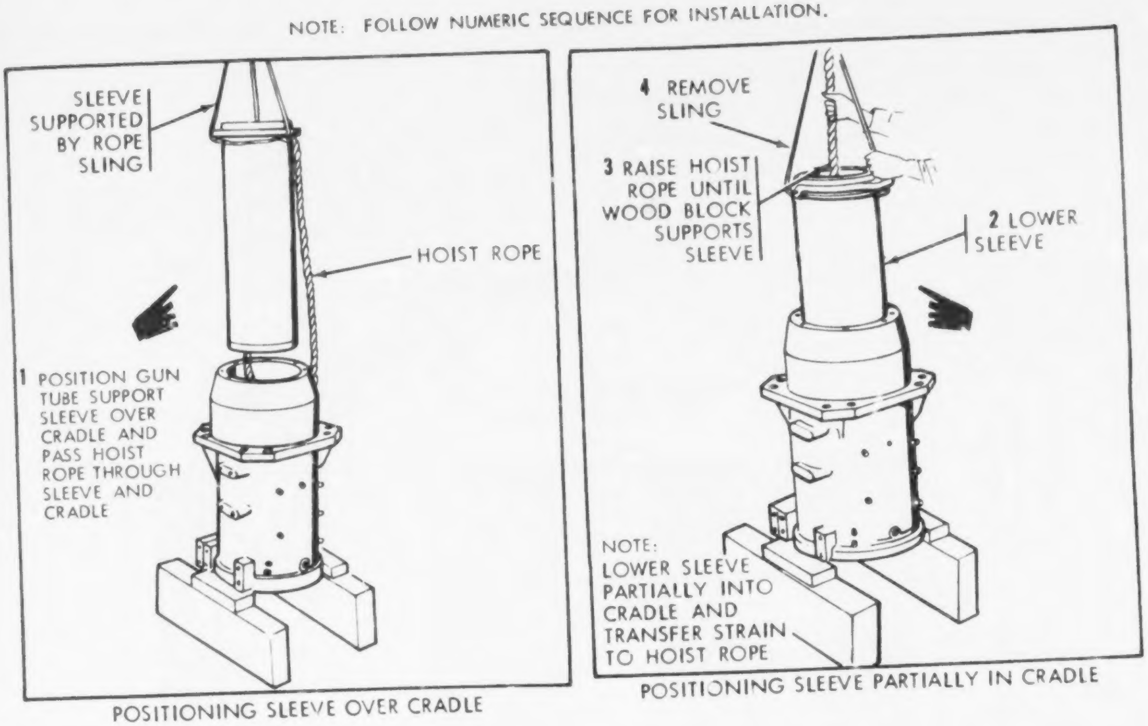
RAISING SUPPORT SLEEVE

SLEEVE AND CRADLE

WE 70200

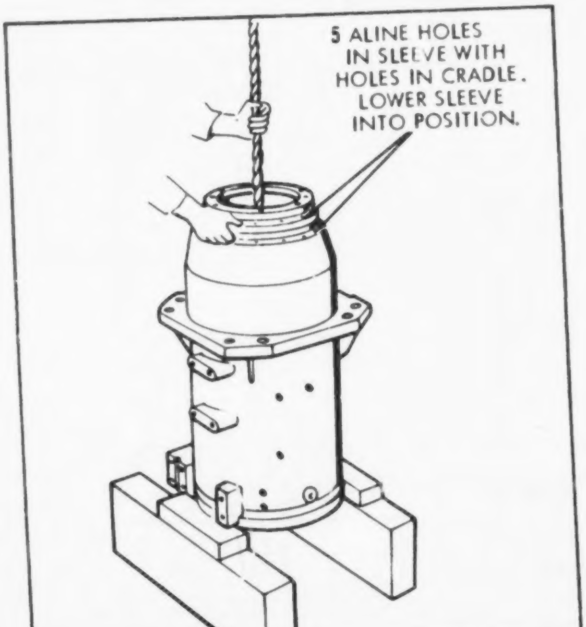
Figure 4-34. Removal of support sleeve from cradle.

NOTE: FOLLOW NUMERIC SEQUENCE FOR INSTALLATION.


SLEEVE SUPPORTED BY ROPE SLING
HOIST ROPE
1 POSITION GUN TUBE SUPPORT SLEEVE OVER CRADLE AND PASS HOIST ROPE THROUGH SLEEVE AND CRADLE
4 REMOVE SLING
3 RAISE HOIST ROPE UNTIL WOOD BLOCK SUPPORTS SLEEVE
2 LOWER SLEEVE
NOTE: LOWER SLEEVE PARTIALLY INTO CRADLE AND TRANSFER STRAIN TO HOIST ROPE

POSITIONING SLEEVE OVER CRADLE

POSITIONING SLEEVE PARTIALLY IN CRADLE


5 ALINE HOLES IN SLEEVE WITH HOLES IN CRADLE. LOWER SLEEVE INTO POSITION.

LOWERING SLEEVE IN POSITION

WE 70201

Figure 4-35. Installation of support sleeve to cradle.

NOTE: ALL DIMENSIONS SHOWN ARE IN INCHES.

TYPE: CARBIDE WA-4 OR VC-4

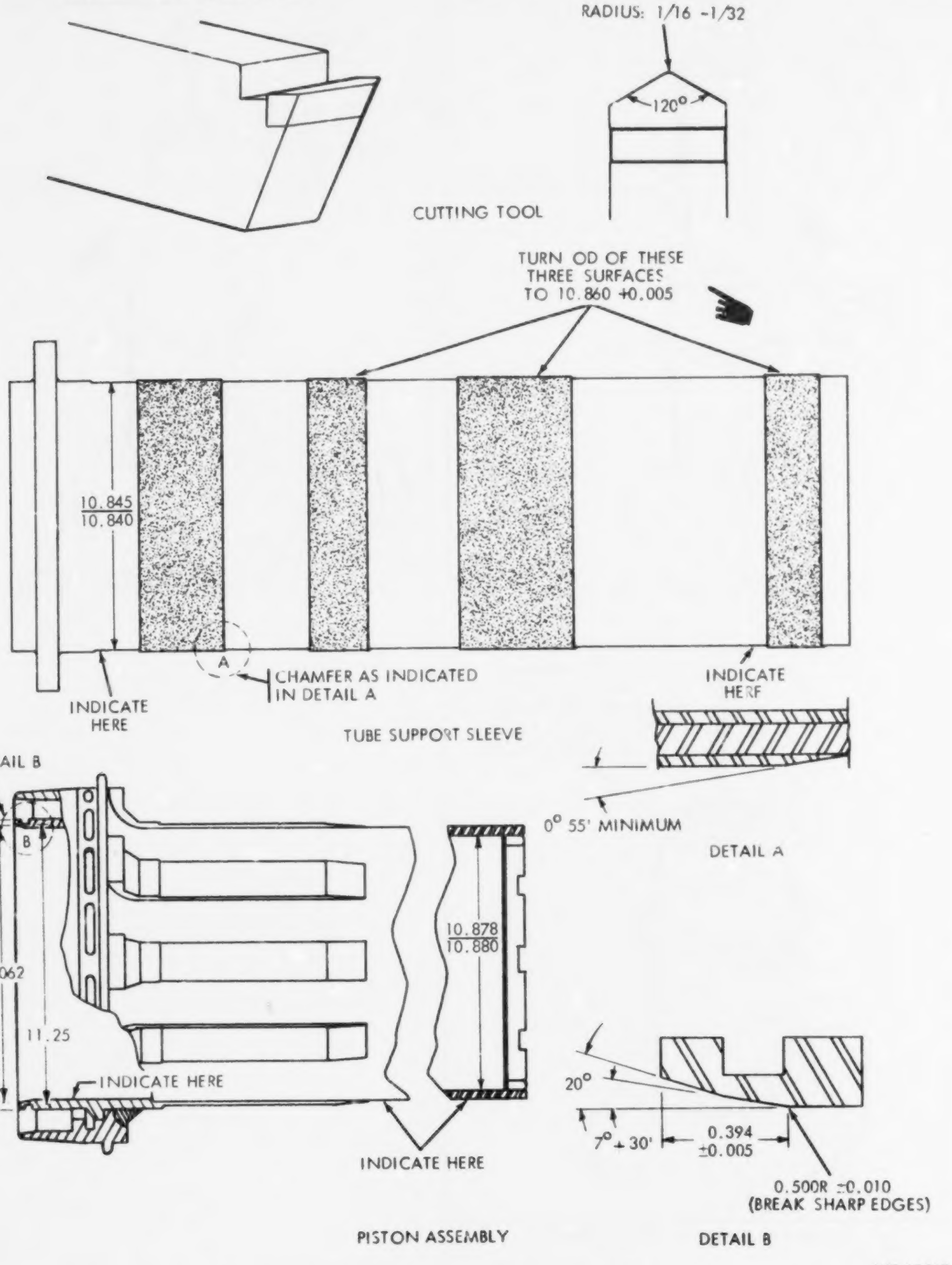
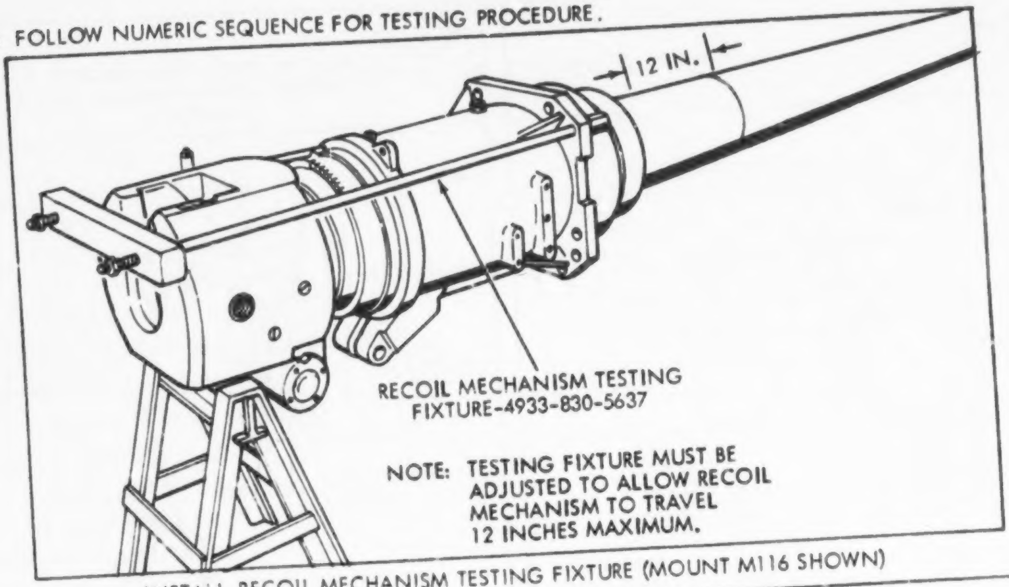

RADIUS: 1/16 -1/32
120°
CUTTING TOOL
TURN OD OF THESE THREE SURFACES TO 10.860 +0.005
10.845
10.840
A
CHAMFER AS INDICATED IN DETAIL A
INDICATE HERE
INDICATE HERE
TUBE SUPPORT SLEEVE
0° 55' MINIMUM
DETAIL A
SEE DETAIL B
B
11.373
11.370
11.062
11.25
INDICATE HERE
10.878
10.880
INDICATE HERE
20°
7° ± 30'
0.394 ±0.005
0.500R ±0.010 (BREAK SHARP EDGES)
PISTON ASSEMBLY
DETAIL B
WE 69463

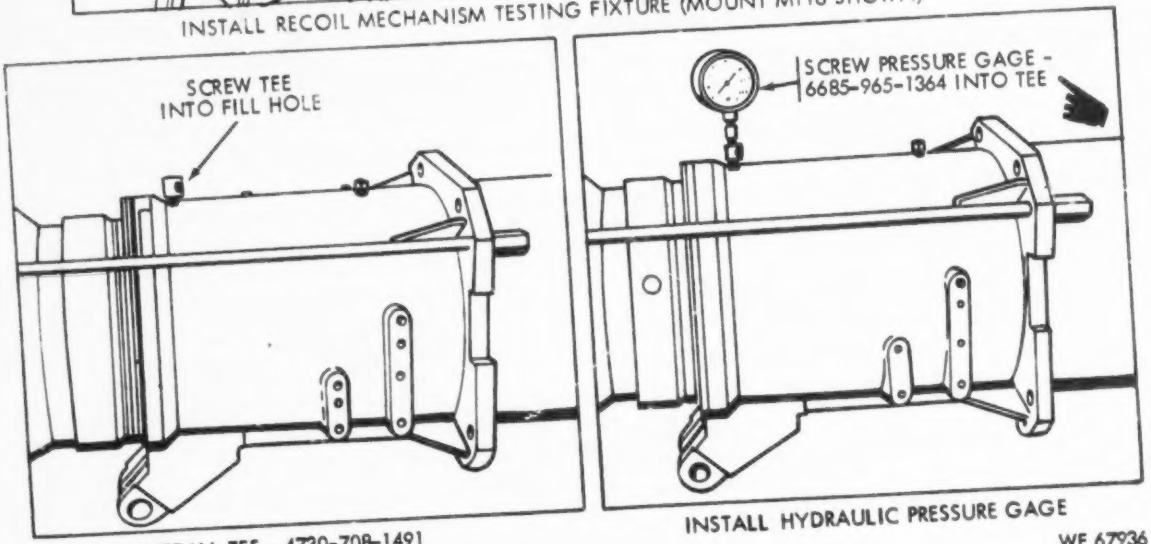
Figure 4-36. Details for machining tube support sleeve and recoil piston assembly.

NOTE: FOLLOW NUMERIC SEQUENCE FOR TESTING PROCEDURE.


12 IN.
RECOIL MECHANISM TESTING FIXTURE-4933-830-5637

NOTE: TESTING FIXTURE MUST BE ADJUSTED TO ALLOW RECOIL MECHANISM TO TRAVEL 12 INCHES MAXIMUM.

INSTALL RECOIL MECHANISM TESTING FIXTURE (MOUNT M116 SHOWN)

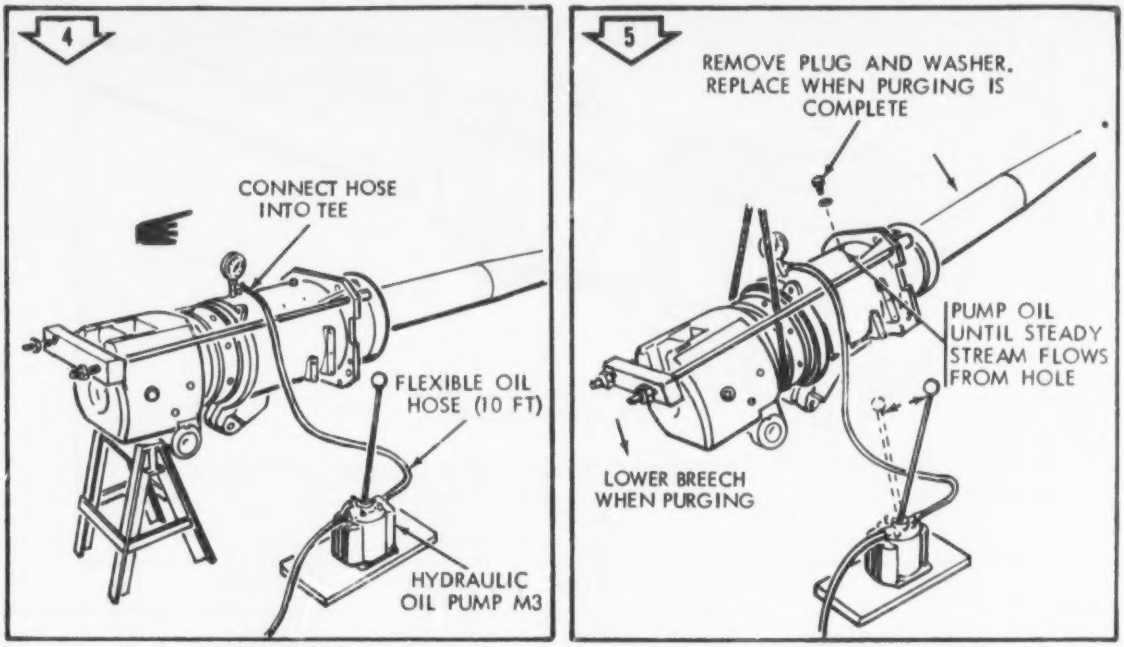

SCREW TEE INTO FILL HOLE
SCREW PRESSURE GAGE - 6685-965-1364 INTO TEE

INSTALL TEE - 4730-708-1491

INSTALL HYDRAULIC PRESSURE GAGE

WE 67936

Figure 4-37. Recoil cylinder pressure leak test (1 of 2).



CONNECT HOSE INTO TEE

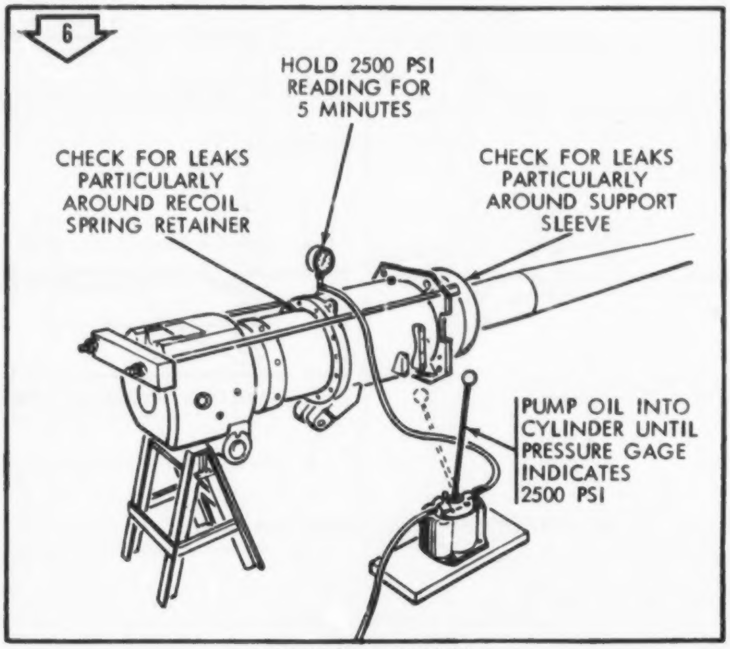
REMOVE PLUG AND WASHER. REPLACE WHEN PURGING IS COMPLETE

PUMP OIL UNTIL STEADY STREAM FLOWS FROM HOLE

LOWER BREECH WHEN PURGING

CONNECT PUMP

PURGE AIR FROM SYSTEM



HOLD 2500 PSI READING FOR 5 MINUTES

CHECK FOR LEAKS PARTICULARLY AROUND RECOIL SPRING RETAINER

CHECK FOR LEAKS PARTICULARLY AROUND SUPPORT SLEEVE

PUMP OIL INTO CYLINDER UNTIL PRESSURE GAGE INDICATES 2500 PSI

CHECK FOR LEAKAGE

WE 67937

Figure 4-3. Recoil cylinder pressure leak test (2 of 2).

CHAPTER 5

REPAIR OF CUPOLA M19

5-1. Electrical Parts Attached to Tank Turret

a. *Remove / Install.* Figure 5-1.

b. *Disassemble / Assemble Interconnecting Box and Wiring.* Figure 5-2.

5-2. Cupola Bearing Components

Disassemble / assemble (figs. 5-3 through 5-5)

5-3. Cupola Wiring Harness

Remove / install (fig. 5-6).

5-4. Sighting Equipment Mounting Components (early M60s)

Remove / install (fig. 5-7).

5-5. Cradle Cover and Cover Assembly

Remove / install (fig. 5-8).

5-6. Screw Jack Assembly and Door Catch

a. *Remove / Install.* Figure 5-9.

b. *Disassembly / Assembly.* Figures 5-10 and 5-11.

c. *Adjustment.* Adjust gear set for screw jack (fig. 5-12) at assembly as follows:

(1) Install nut (19, fig. 5-10) and tighten to insure a solid section through bearing races (22 and 24, fig. 5-10). Loosen nut and reset to 20 ±5 inch-pounds and lock in position.

(2) Torque setscrews (14, fig. 5-10) to 12 ±2 inch-pounds.

(3) Install crank assembly and adjust gearshaft (13, fig. 5-10) between 0.002-inch (min) and 0.009-inch (max) backlash measured at 2.5-inch radius from gear center. Peel shim (11, fig. 5-10), as necessary, to obtain specified backlash. For procedure for measuring backlash refer to B, figure 5-12.

(4) Extend centerline of gear eye 4-inches ±1 / 4-inch from surface A (A, fig. 5-12) and suspend a 60-pound load from gear. Adjust nut (18, fig. 5-10) finger tight against surface A. Insert key (25, fig. 5-10) and lock with ring (26, fig. 5-10).

(5) Requirement for screw jack assembly (not installed): Must push and pull 60-pound axial load through its full working stroke with a hand crank effort not to exceed 15 inch-pounds.

5-7. Cupola Cradle and Related Parts (Fig. 5-13)

a. *Remove / Install.* TM 9-2350-215-20.

b. *Disassemble / Assemble.* Figures 5-14 and 5-15.

5-8. Hatch Door Group

a. *Remove / Install.* Figures 5-16.

b. *Disassemble / Assembly.* Figures 5-17.

5-9. Cupola Interior Parts

Remove / install (fig. 5-18).

5-10. Ammunition Feed System and Periscope Stowage Arm

Disassemble / assemble (fig. 5-19).

5-11. Azimuth Lock Assembly

Disassemble / assemble (fig. 5-20).

5-12. Azimuth Gear Box

a. Adjust (fig. 5-21) if other repair is unnecessary.

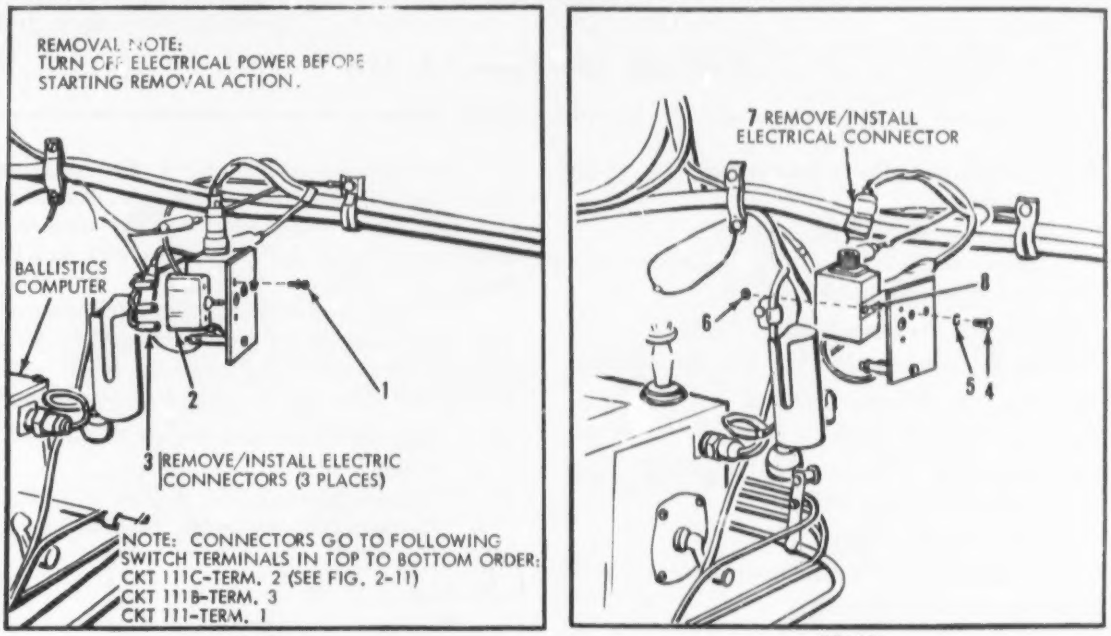
b. Disassemble / assemble as shown in figures 5-22 through 5-26.

c. Adjust after repair, prior to installation (fig. 5-21).

5-13. Inspection and Repair

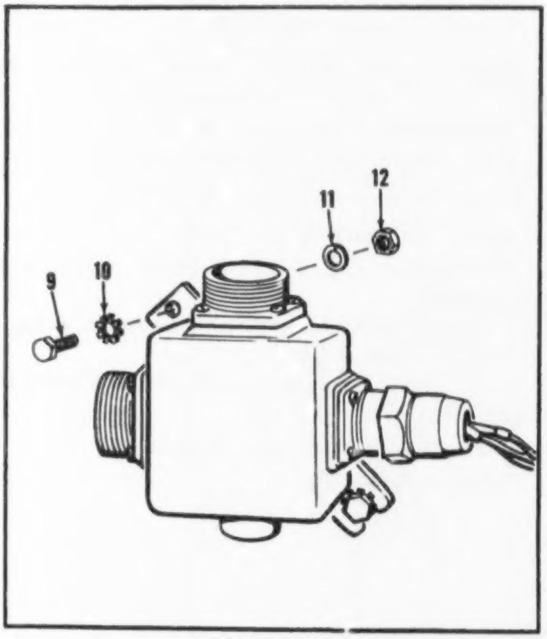
Refer to table 13.

NOTE: FOLLOW NUMERIC SEQUENCE FOR REMOVAL. REVERSE SEQUENCE FOR INSTALLATION.


REMOVAL NOTE:
TURN OFF ELECTRICAL POWER BEFORE STARTING REMOVAL ACTION.
BALLISTICS COMPUTER
1
2
3 REMOVE/INSTALL ELECTRIC CONNECTORS (3 PLACES)
NOTE: CONNECTORS GO TO FOLLOWING SWITCH TERMINALS IN TOP TO BOTTOM ORDER:
CKT 111C-TERM. 2 (SEE FIG. 2-11)
CKT 111B-TERM. 3
CKT 111-TERM. 1
7 REMOVE/INSTALL ELECTRICAL CONNECTOR
8
6
5
4

SWITCH

RELAY



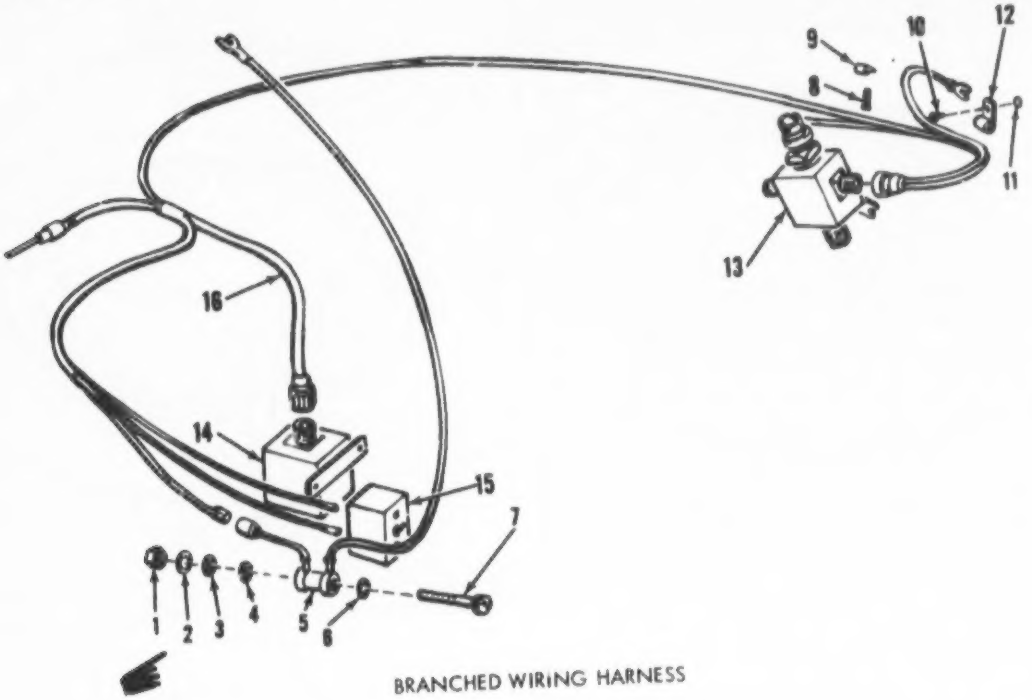
INTERCONNECTING BOX
MOUNTING HARDWARE

1 - SCREW (2)
2 - SWITCH
4 - SCREW (2)
5 - WASHER (2)
6 - NUT (2)
8 - RELAY
9 - SCREW (2)
10 - WASHER (2)
11 - WASHER (2)
12 - NUT (2)

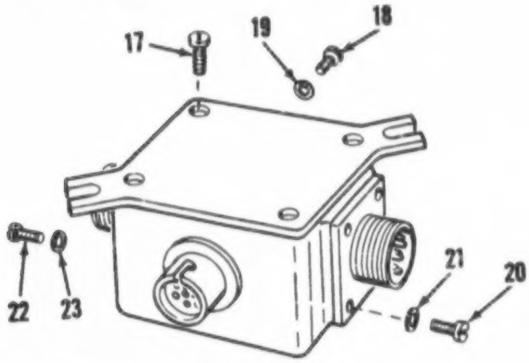
WE 12933

Figure 5-1. Removal/installation of cupola electrical parts located in turret.

NOTE: FOLLOW NUMERIC SEQUENCE FOR DISASSEMBLY. REVERSE SEQUENCE FOR ASSEMBLY.



BRANCHED WIRING HARNESS



NOTE: NO FURTHER DISASSEMBLY AUTHORIZED.

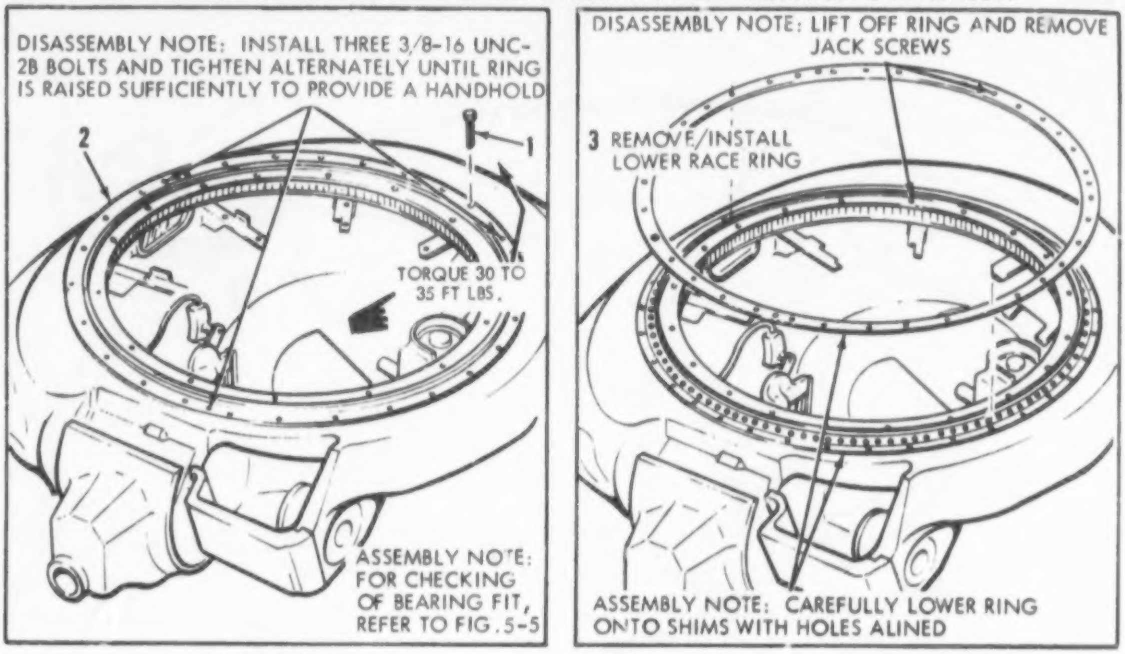
WE 67951

INTERCONNECTING BOX

LEGEND to fig. 5-2:
1—Nut
2—Washer
3—Washer
4—Washer
5—Resistor Assembly
6—Washer
7—Screw
8—Bolt (2)
9—Clamp (2) (M60)
Strap (M60A1)
10—Bolt
11—Washer
12—Clamp (2) (M60)
Strap (M60A1)
13—Interconnecting box
14—Relay
15—Switch
16—Wiring harness
17—Screw
18—Screw
19—Washer
20—Screw
21—Washer
22—Screw
23—Washer

Figure 5-2. Disassembly/assembly of interconnecting box and wiring.

NOTE: FOLLOW NUMERICAL SEQUENCE FOR DISASSEMBLY. REVERSE SEQUENCE FOR ASSEMBLY.



DISASSEMBLY NOTE: INSTALL THREE 3/8-16 UNC-2B BOLTS AND TIGHTEN ALTERNATELY UNTIL RING IS RAISED SUFFICIENTLY TO PROVIDE A HANDHOLD

TORQUE 30 TO 35 FT LBS.

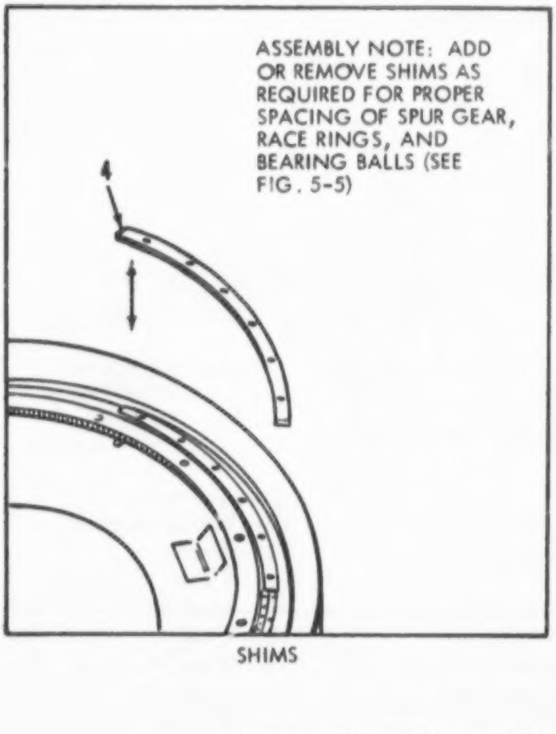
ASSEMBLY NOTE: FOR CHECKING OF BEARING FIT, REFER TO FIG. 5-5

DISASSEMBLY NOTE: LIFT OFF RING AND REMOVE JACK SCREWS

ASSEMBLY NOTE: CAREFULLY LOWER RING ONTO SHIMS WITH HOLES ALINED

RACE RING

LOWER RACE RING



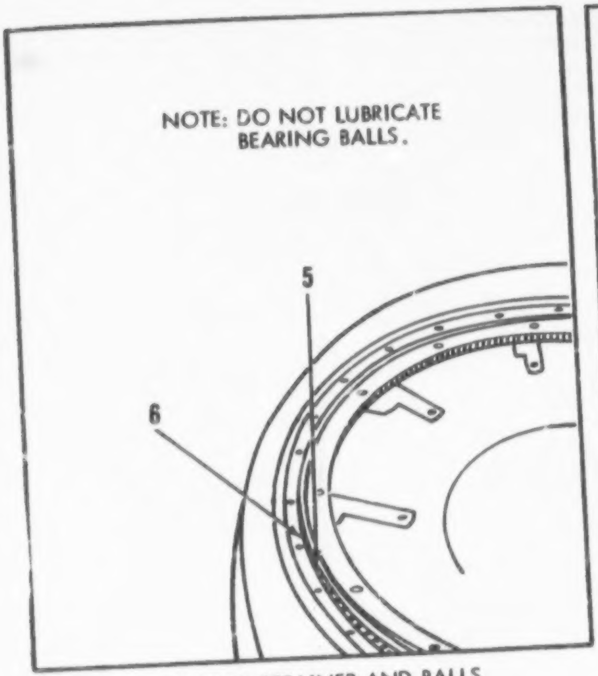
ASSEMBLY NOTE: ADD OR REMOVE SHIMS AS REQUIRED FOR PROPER SPACING OF SPUR GEAR, RACE RINGS, AND BEARING BALLS (SEE FIG. 5-5)

SHIMS

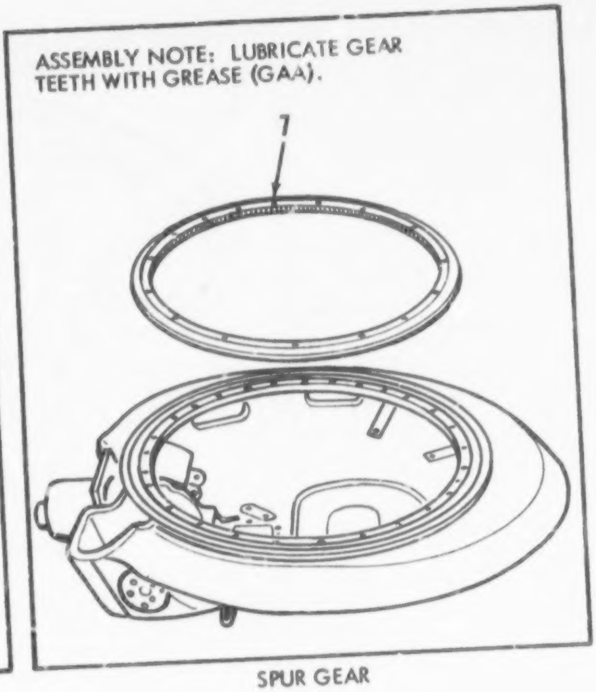
1 - SCREW (30)
2 - RING
4 - SHIM

WE 67952

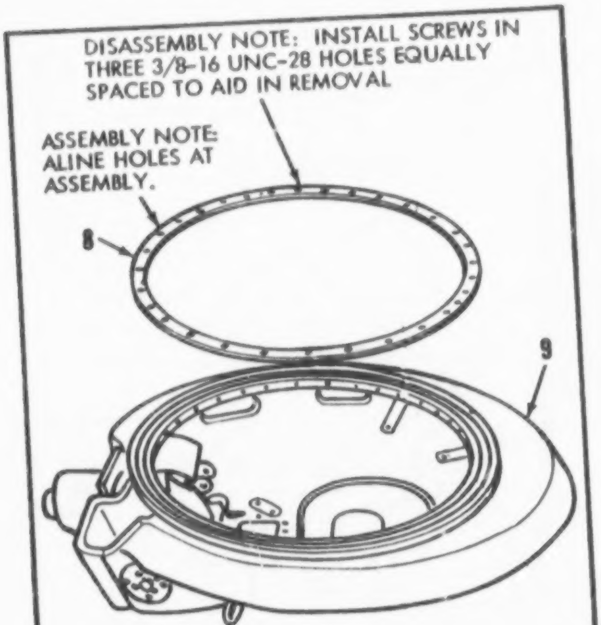
Figure 5-3. Disassembly / assembly of cupola bearing components (1 of 2).


NOTE: DO NOT LUBRICATE BEARING BALLS.

BEARING RETAINER AND BALLS


ASSEMBLY NOTE: LUBRICATE GEAR TEETH WITH GREASE (GAA).

SPUR GEAR


DISASSEMBLY NOTE: INSTALL SCREWS IN THREE 3/8-16 UNC-28 HOLES EQUALLY SPACED TO AID IN REMOVAL

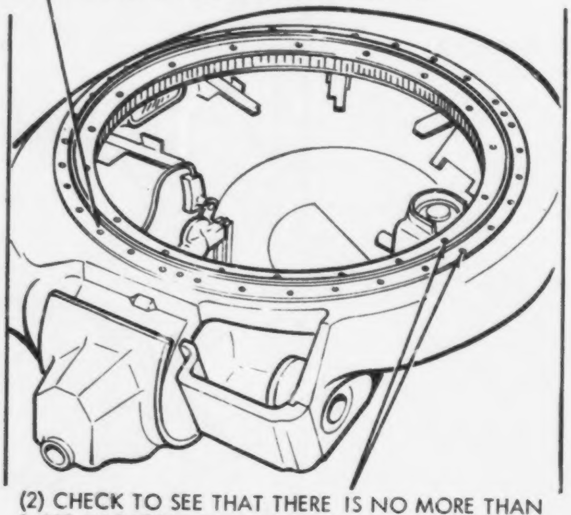
ASSEMBLY NOTE: ALINE HOLES AT ASSEMBLY.

UPPER RACE RING

5 - BALL (234)
6 - RETAINER
7 - GEAR
8 - RING
9 - CUPOLA BODY

WE 12934

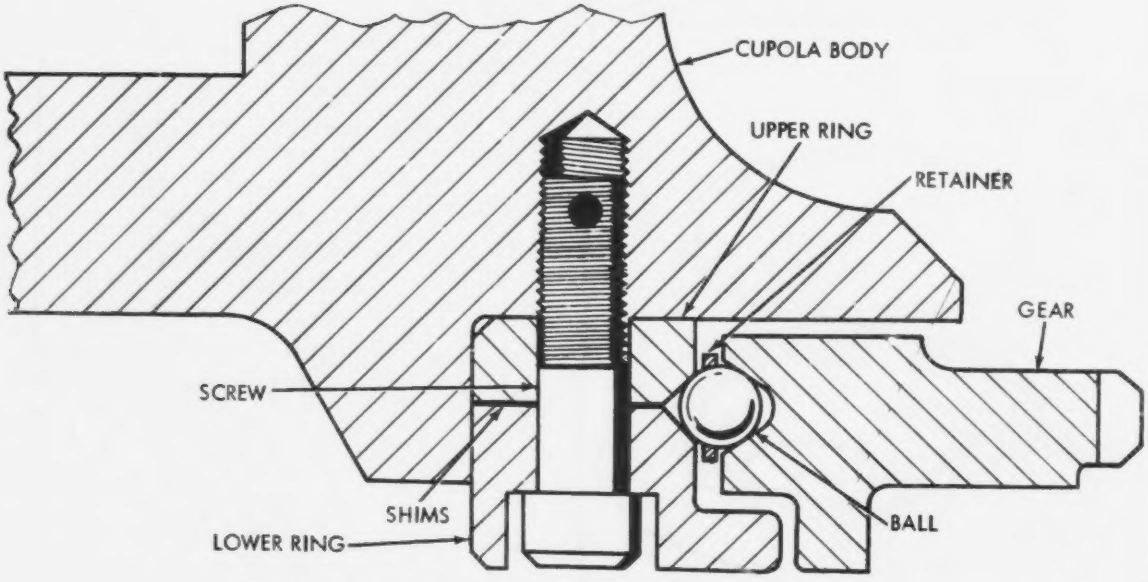
Figure 5-4. Disassembly/assembly of cupola bearing components (2 of 2).



(1) INSTALL BEARING ATTACHING SCREWS IN EIGHT HOLES EQUALLY SPACED

(2) CHECK TO SEE THAT THERE IS NO MORE THAN 0.003 IN RADIAL PLAY BETWEEN SPUR GEAR AND RACE RINGS AND THAT TORQUE REQUIRED TO ROTATE SPUR GEAR 360 DEG. (WITH CUPOLA INVERTED AS SHOWN) DOES NOT EXCEED 75 IN.-LB. IF NECESSARY, ADD OR REMOVE SHIMS (FIG. 5-3)

CHECK OF BEARING FIT

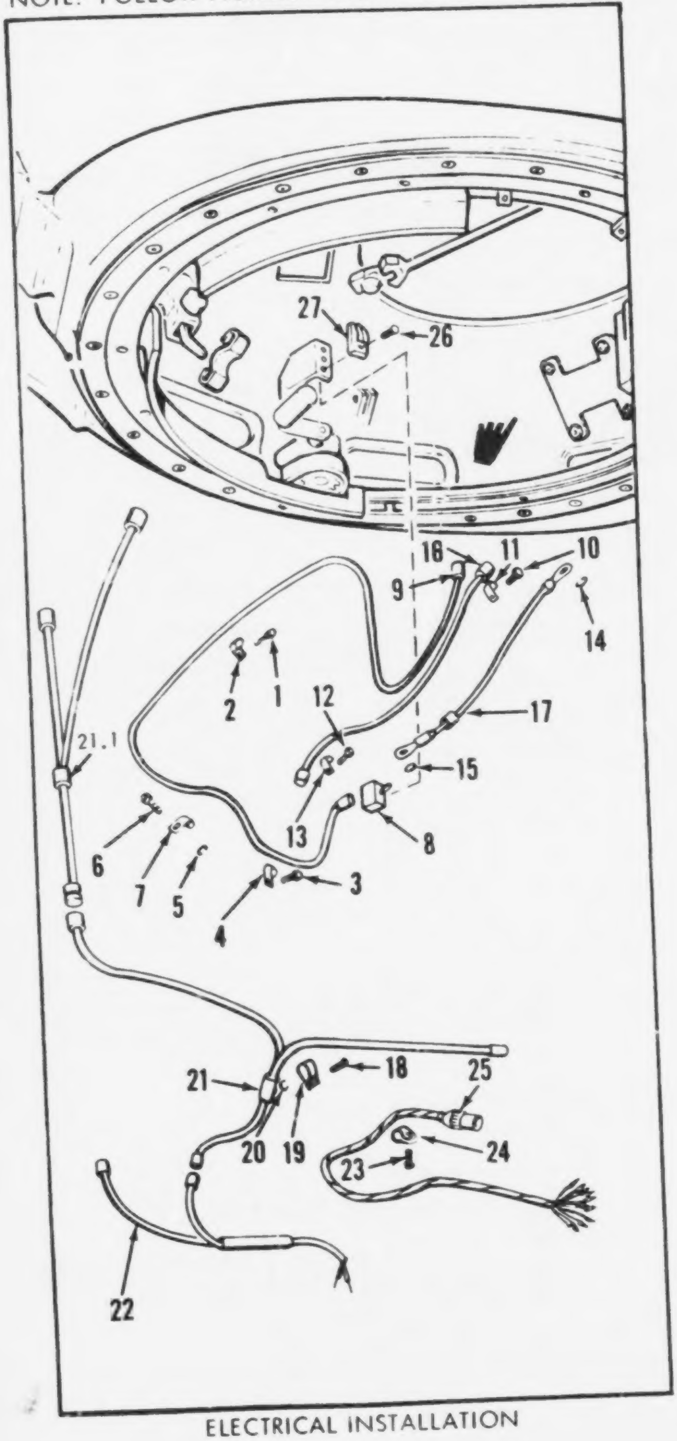

CUPOLA BODY
UPPER RING
RETAINER
GEAR
SCREW
SHIMS
LOWER RING
BALL

ASSEMBLY OF CUPOLA BEARING COMPONENTS - CROSS SECTION

WE 9970

Figure 5-5. Assembly guide for cupola bearing components.

NOTE: FOLLOW NUMERIC SEQUENCE FOR DISASSEMBLY. REVERSE SEQUENCE FOR ASSEMBLY


27
26
16
11
10
9
14
2
1
12
17
21.1
15
13
8
6
7
5
4
3
21
18
25
20
19
24
23
22

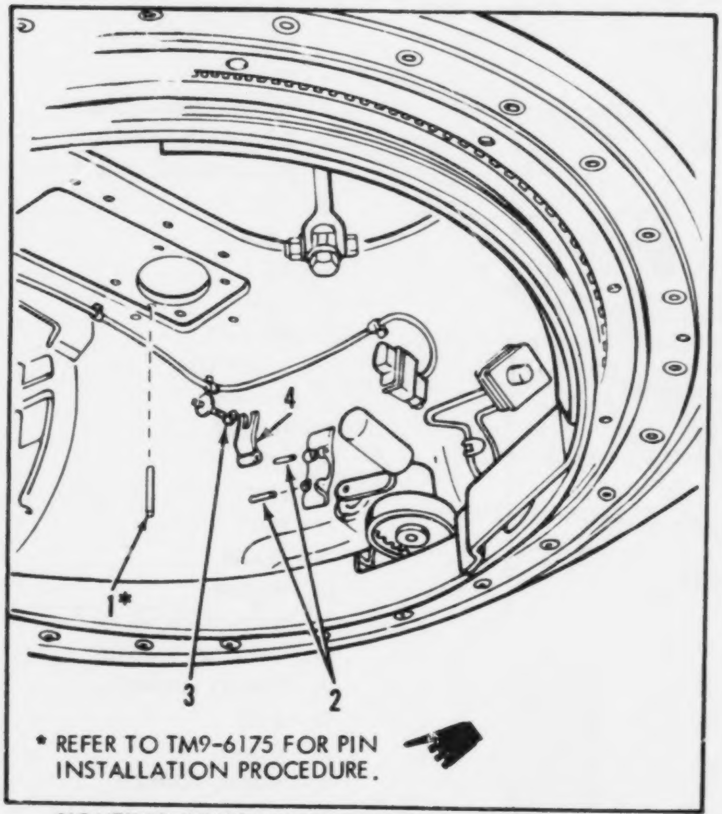
1 - BOLT (7)
2 - CLAMP (7)
3 - BOLT
4 - CLAMP
5 - WASHER (M60A1 ONLY)
6 - BOLT (M60A1 ONLY)
7 - CLAMP (M60A1 ONLY)
8 - SWITCH
9 - LEAD
10 - BOLT
11 - CLAMP
12 - BOLT (3)
13 - CLAMP (3)
14 - WASHER
15 - WASHER
16 - LEAD
17 - LEAD
18 - BOLT
19 - CLAMP
20 - WASHER
21 - WIRING HARNESS
21.1 - WIRING HARNESS
22 - WIRING HARNESS
23 - BOLT
24 - CLAMP
25 - WIRING HARNESS
26 - SCREW (2)
27 - GUARD

ELECTRICAL INSTALLATION

WE 70205

Figure 5-6. Removal/installation of wiring harness.

NOTE: FOLLOW NUMERIC SEQUENCE FOR DISASSEMBLY. REVERSE SEQUENCE FOR ASSEMBLY.


4
1*
3
2
* REFER TO TM9-6175 FOR PIN INSTALLATION PROCEDURE.

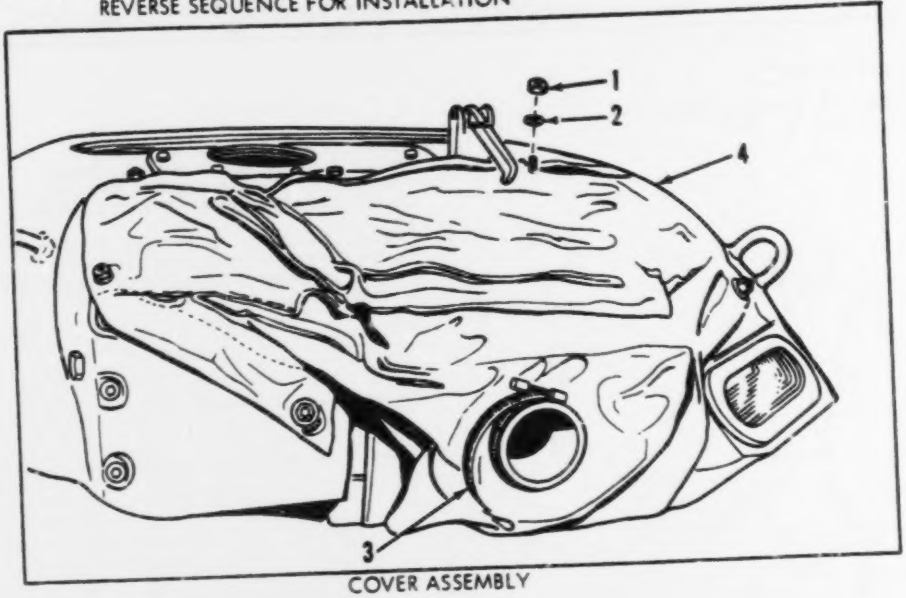
1 - PIN (2)
2 - PIN
3 - NUT
4 - CLAMP

SIGHTING EQUIPMENT ATTACHING COMPONENTS

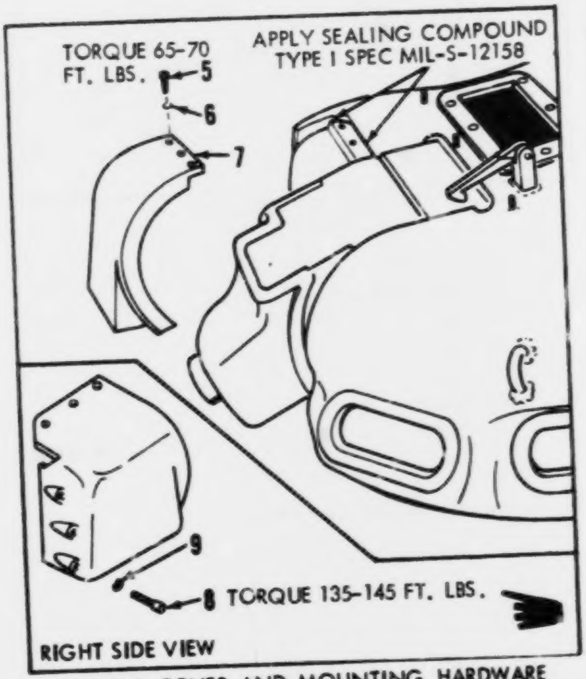
WE 68589

Figure 5-7. Sighting equipment mounting components (M60—serial no. 1 through 184 only).

NOTE: FOLLOW NUMERIC SEQUENCE FOR REMOVAL
REVERSE SEQUENCE FOR INSTALLATION



COVER ASSEMBLY


TORQUE 65-70 FT. LBS.
5
6
7
APPLY SEALING COMPOUND TYPE I SPEC MIL-S-12158
8
9
8
TORQUE 135-145 FT. LBS.
RIGHT SIDE VIEW

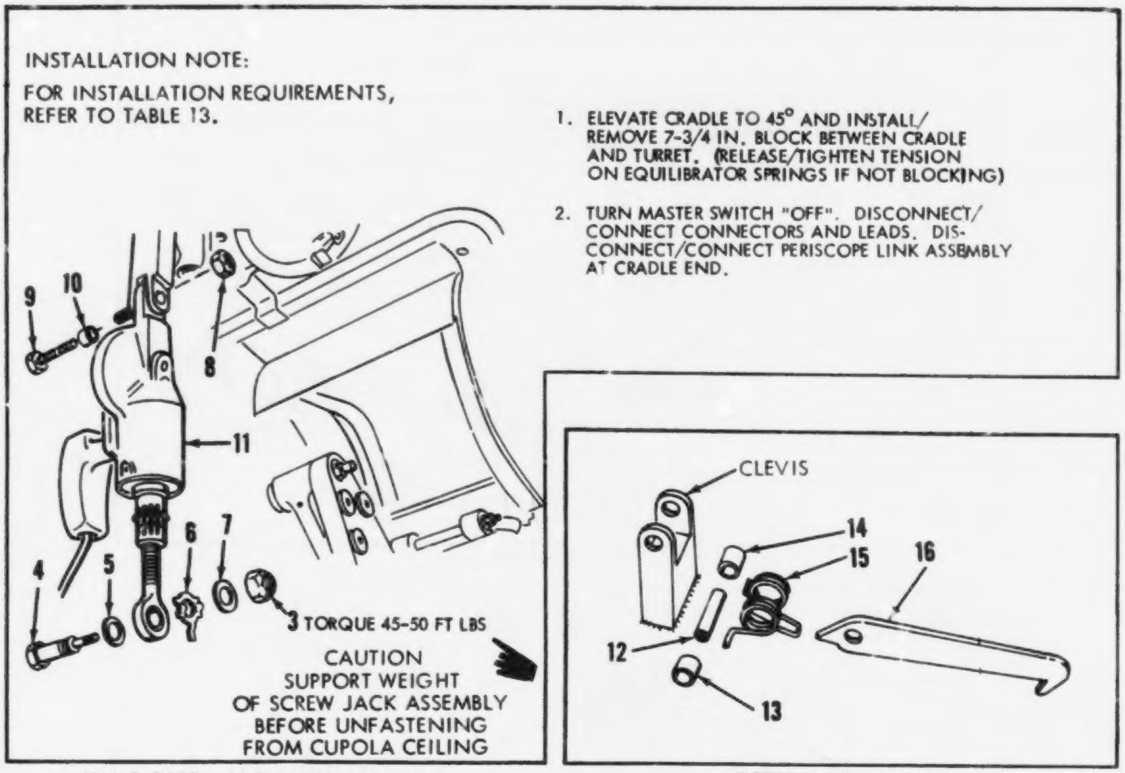
CRADLE COVER AND MOUNTING HARDWARE

1 - NUT (8)
2 - WASHER (8)
3 - CLAMP
4 - COVER ASSEMBLY
5 - SCREW (3)
6 - WASHER (3)
7 - COVER
8 - SCREW (3)
9 - WASHER (3)

WE 67954

Figure 5-8. Removal/installation of cover assembly and cradle cover.

NOTE: FOLLOW NUMERIC SEQUENCE FOR REMOVAL. REVERSE SEQUENCE FOR INSTALLATION.



INSTALLATION NOTE:
FOR INSTALLATION REQUIREMENTS, REFER TO TABLE 13.

1. ELEVATE CRADLE TO 45° AND INSTALL/REMOVE 7-3/4 IN. BLOCK BETWEEN CRADLE AND TURRET. (RELEASE/TIGHTEN TENSION ON EQUILIBRATOR SPRINGS IF NOT BLOCKING)
2. TURN MASTER SWITCH "OFF". DISCONNECT/CONNECT CONNECTORS AND LEADS. DISCONNECT/CONNECT PERISCOPE LINK ASSEMBLY AT CRADLE END.

3 TORQUE 45-50 FT LBS

CAUTION
SUPPORT WEIGHT
OF SCREW JACK ASSEMBLY
BEFORE UNFASTENING
FROM CUPOLA CEILING

HAND SCREW JACK ASSEMBLY AND ATTACHING COMPONENTS

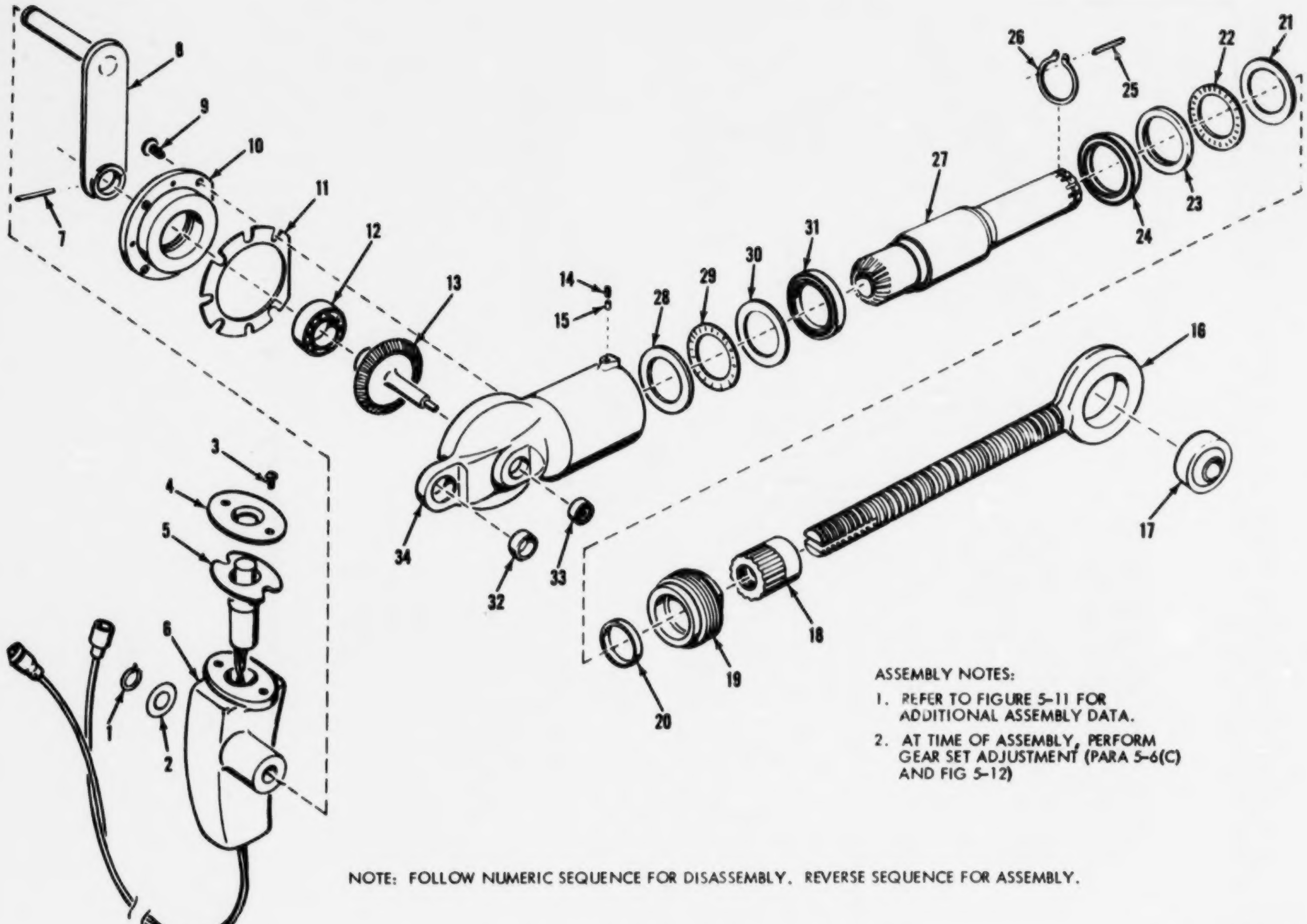
ACCESS DOOR CATCH

3 - NUT
4 - BOLT
5 - WASHER
6 - SPRING
7 - WASHER
8 - NUT
9 - BOLT

10 - BUSHING
11 - JACK ASSEMBLY
12 - PIN
13 - TUBE
14 - TUBE
15 - SPRING
16 - CATCH

WE 67955

Figure 5-9. Removal / installation of screw jack assembly and door catch.


1
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3
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5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34

ASSEMBLY NOTES:

1. REFER TO FIGURE 5-11 FOR ADDITIONAL ASSEMBLY DATA.
2. AT TIME OF ASSEMBLY, PERFORM GEAR SET ADJUSTMENT (PARA 5-6(C) AND FIG 5-12)

NOTE: FOLLOW NUMERIC SEQUENCE FOR DISASSEMBLY. REVERSE SEQUENCE FOR ASSEMBLY.

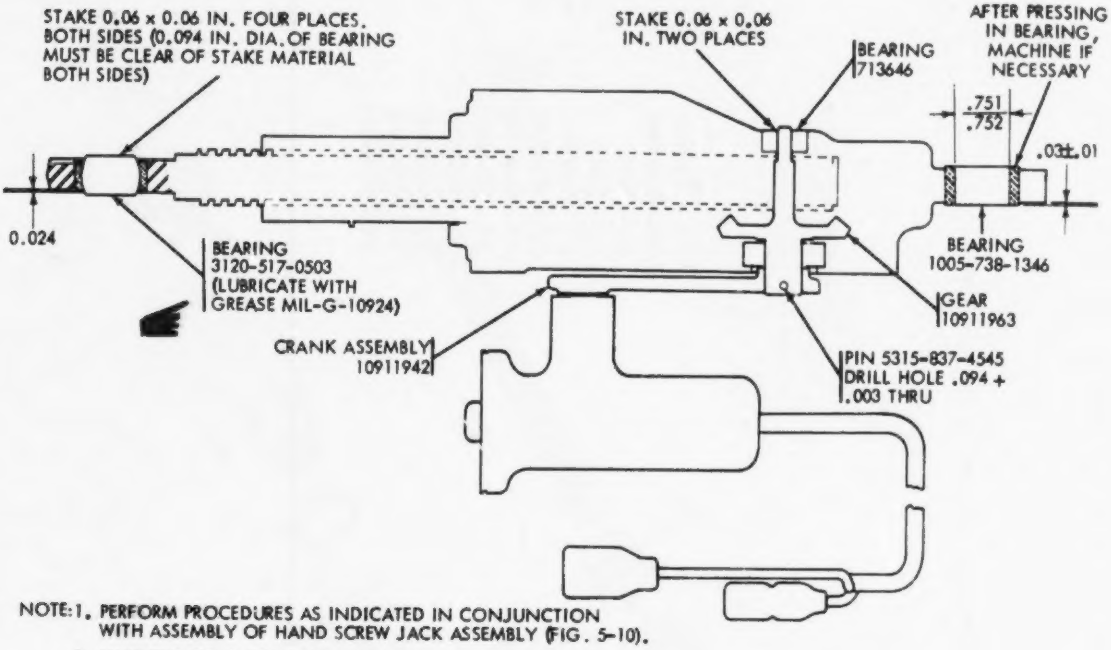
WE 67910

Figure 5-10. Disassembly / assembly of screw jack assembly.

LEGEND to fig. 5-10:

1—Ring
2—Washer
3—Screw (2)
4—Cap
5—Switch
6—Handle
7—Pin
8—Crank
9—Screw (4)
10—Cover assembly
11—Shim
12—Bearing
13—Gear
14—Setscrew (2)
15—Plug (2)
16—Gear
17—Bearing
18—Nut
19—Nut
20—Seal
21—Washer
22—Bearing
23—Washer
24—Bearing
25—Key
26—Ring
27—Gear
28—Washer
29—Bearing
30—Washer
31—Bearing
32—Bearing
33—Bearing
34—Housing

Figure 5-10—Continued

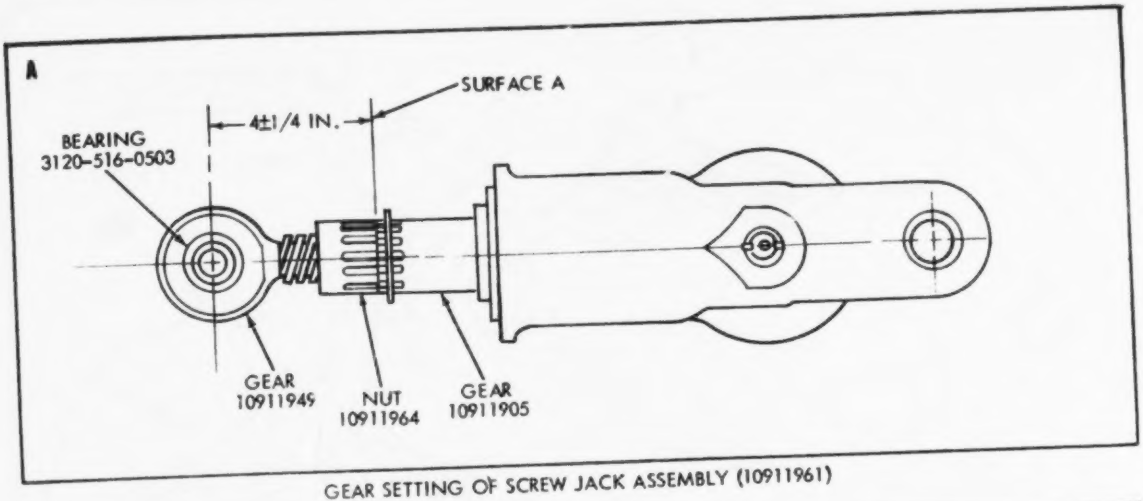

STAKE 0.06 x 0.06 IN. FOUR PLACES, BOTH SIDES (0.094 IN. DIA. OF BEARING MUST BE CLEAR OF STAKE MATERIAL BOTH SIDES)
STAKE 0.06 x 0.06 IN. TWO PLACES
BEARING 713646
AFTER PRESSING IN BEARING, MACHINE IF NECESSARY
.751
.752
.03±.01
0.024
BEARING 3120-517-0503 (LUBRICATE WITH GREASE MIL-G-10924)
BEARING 1005-738-1346
GEAR 10911963
CRANK ASSEMBLY 10911942
PIN 5315-837-4545 DRILL HOLE .094 + .003 THRU

NOTE: 1. PERFORM PROCEDURES AS INDICATED IN CONJUNCTION WITH ASSEMBLY OF HAND SCREW JACK ASSEMBLY (FIG. 5-10).

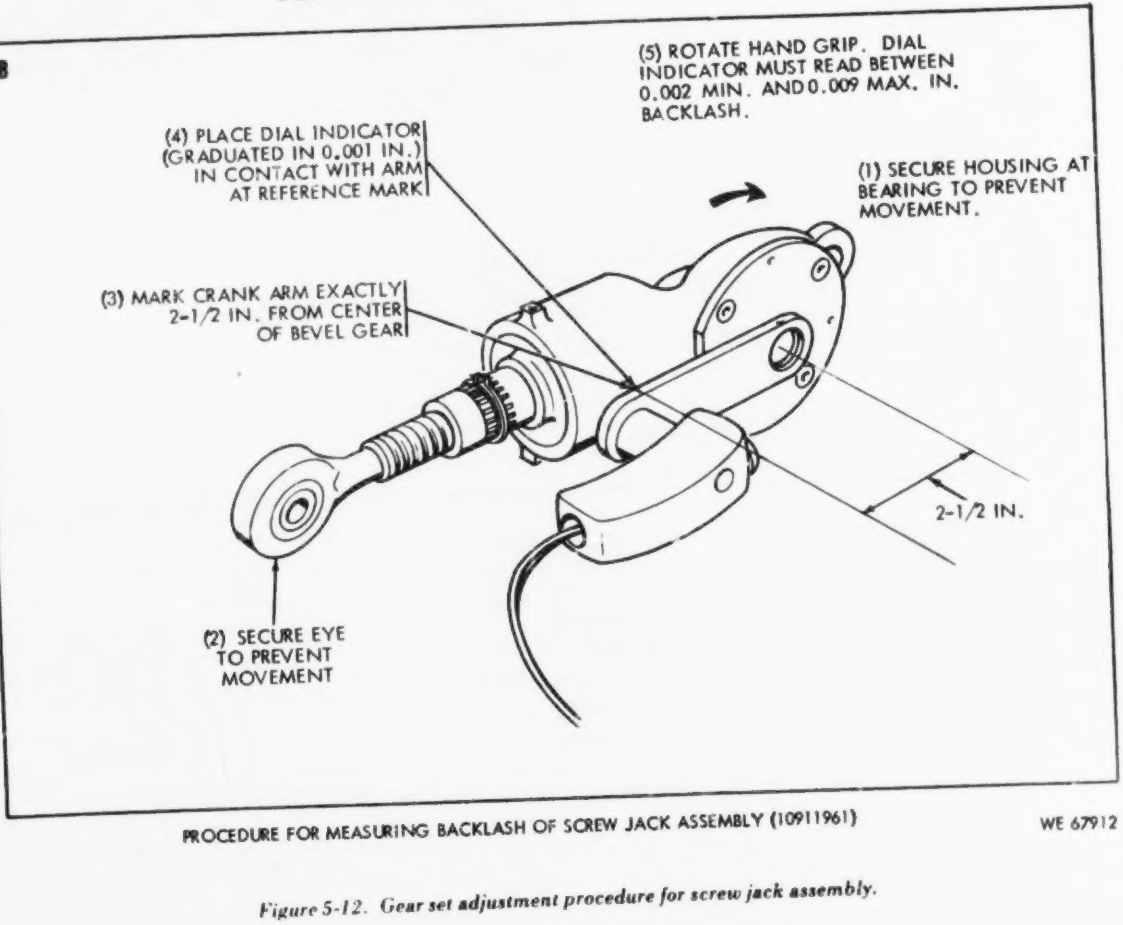
2. HALF FILL GEAR COMPARTMENT WITH GREASE (GAA).

WE 67911

Figure 5-11. Data for assembling screw jack.


A
SURFACE A
4±1/4 IN.
BEARING
3120-516-0503
GEAR
10911949
NUT
10911964
GEAR
10911905

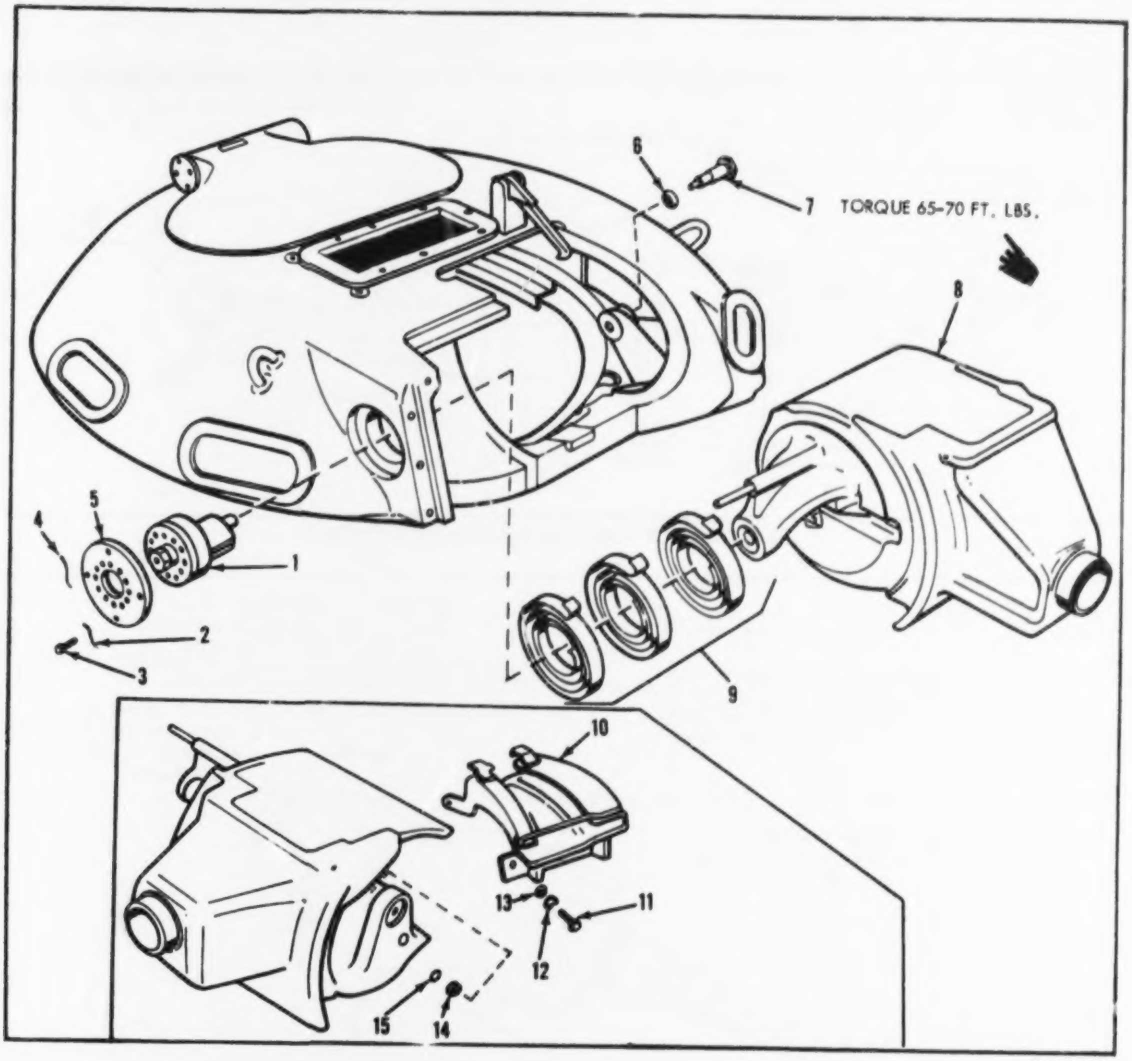
GEAR SETTING OF SCREW JACK ASSEMBLY (10911961)


B
(5) ROTATE HAND GRIP. DIAL INDICATOR MUST READ BETWEEN 0.002 MIN. AND 0.009 MAX. IN. BACKLASH.
(4) PLACE DIAL INDICATOR (GRADUATED IN 0.001 IN.) IN CONTACT WITH ARM AT REFERENCE MARK
(1) SECURE HOUSING AT BEARING TO PREVENT MOVEMENT.
(3) MARK CRANK ARM EXACTLY 2-1/2 IN. FROM CENTER OF BEVEL GEAR
2-1/2 IN.
(2) SECURE EYE TO PREVENT MOVEMENT

PROCEDURE FOR MEASURING BACKLASH OF SCREW JACK ASSEMBLY (10911961)

WE 67912

Figure 5-12. Gear set adjustment procedure for screw jack assembly.

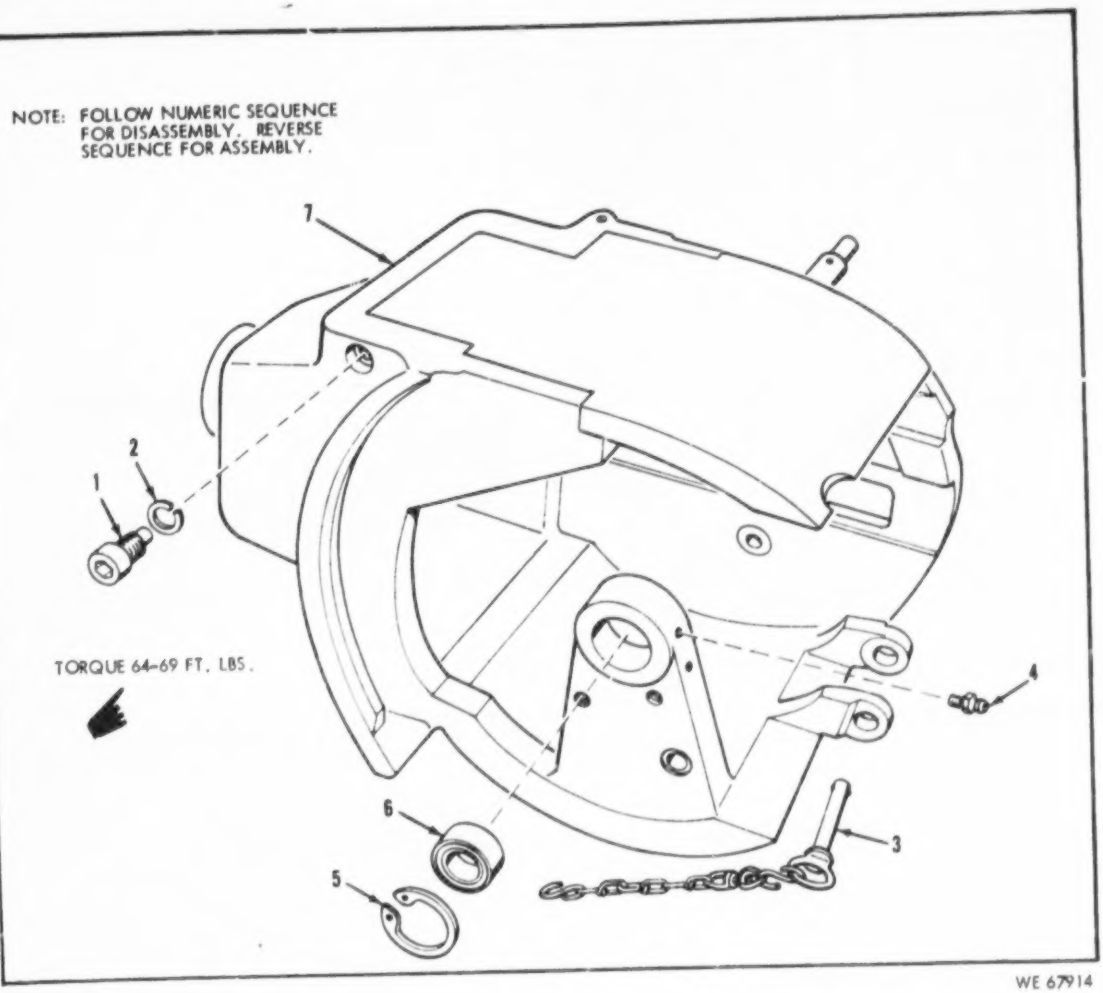

6
7
TORQUE 65-70 FT. LBS.
8
5
4
1
2
3
9
10
13
11
12
15
14

WE 67913

LEGEND to fig. 5-13:

1—Shaft assembly
2—Wire
3—Screw (8)
4—Wire
5—Retainer
6—Spacer
7—Bolt
8—Cradle assembly
9—Spring
10—Chute
11—Screw (2)
12—Washer (2)
13—Washer (2)
14—Nut
15—Washer

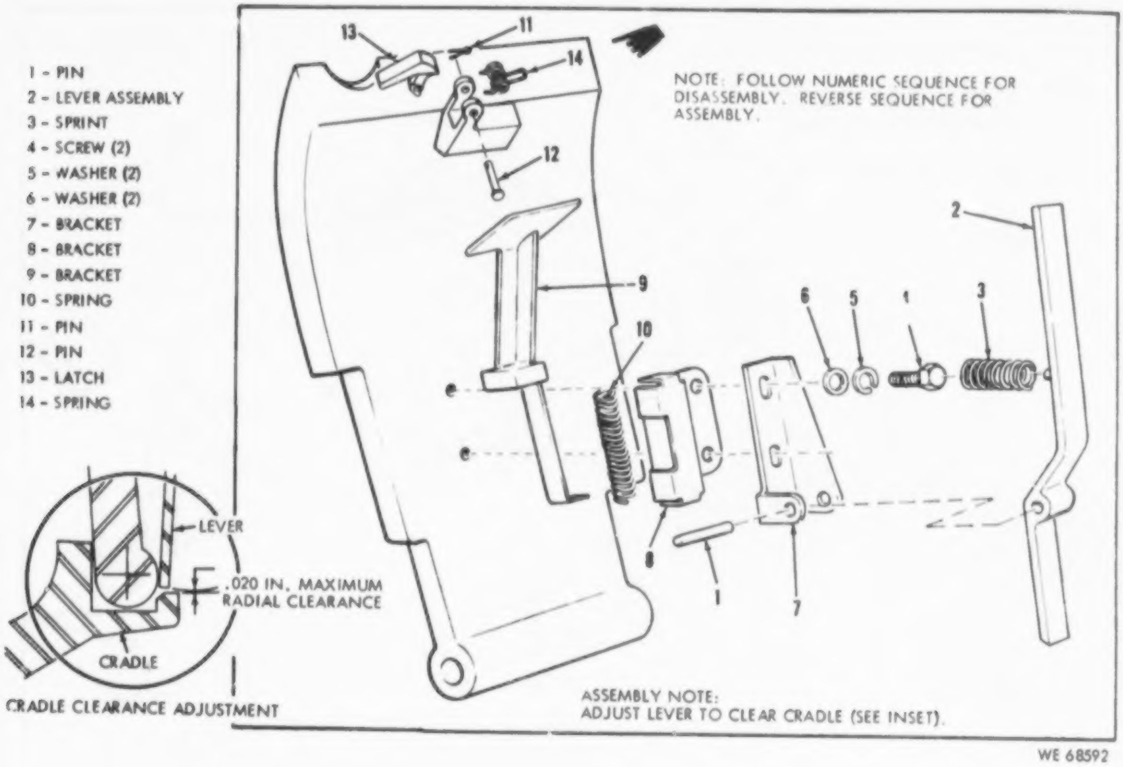
Figure 5-13. Cupola cradle and related parts—exploded view.


NOTE: FOLLOW NUMERIC SEQUENCE FOR DISASSEMBLY. REVERSE SEQUENCE FOR ASSEMBLY.
7
2
1
TORQUE 64-69 FT. LBS.
4
6
3
5
WE 67914

LEGEND to fig. 5-14:

1—Screw (2)
2—Washer (2)
3—Pin assembly
4—Fitting (2)
5—Ring (2)
6—Bearing (2)
7—Cradle assembly

Figure 5-14. Disassembly/assembly of cupola cradle and related parts.

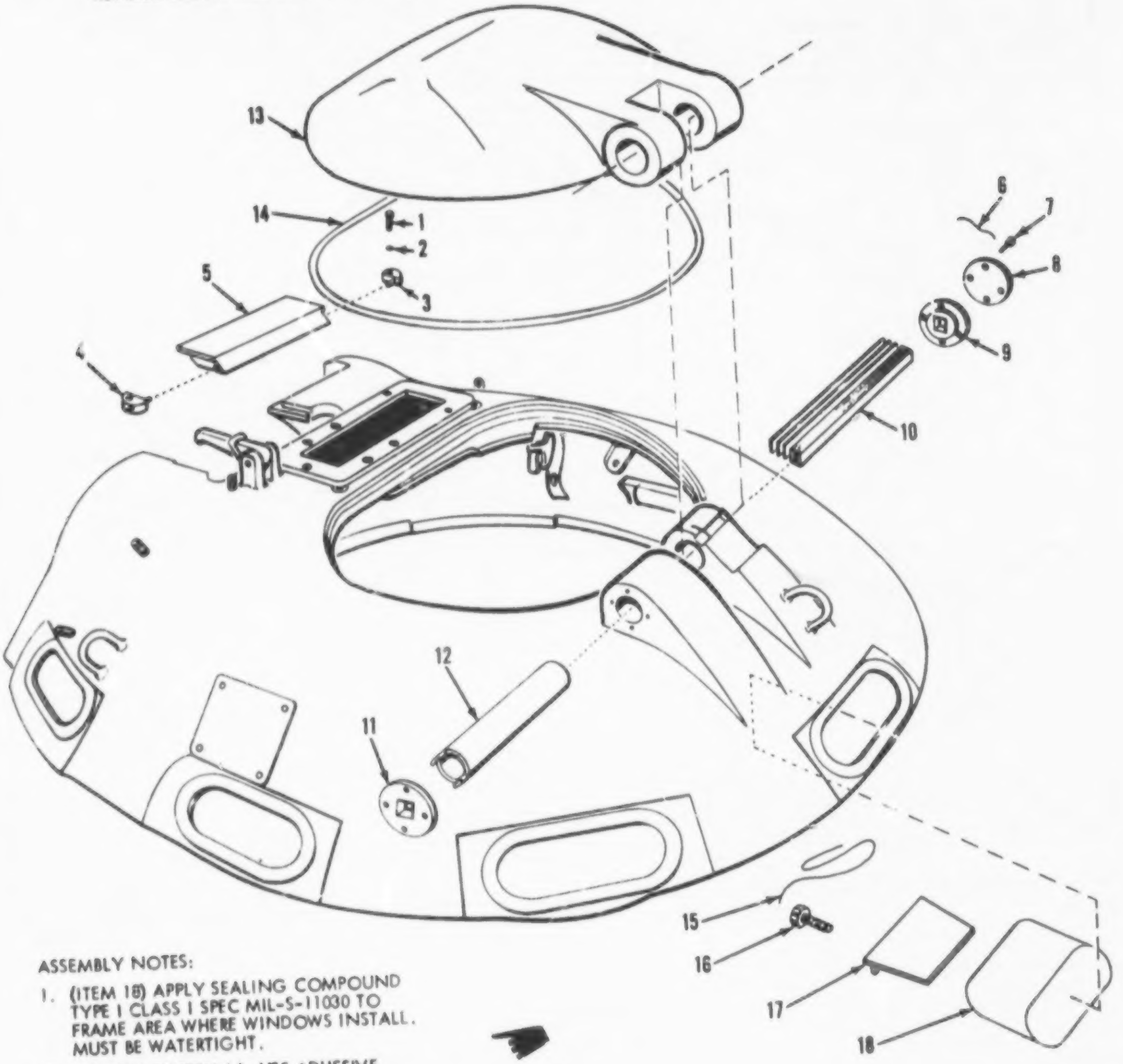

1 - PIN
2 - LEVER ASSEMBLY
3 - SPRINT
4 - SCREW (2)
5 - WASHER (2)
6 - WASHER (2)
7 - BRACKET
8 - BRACKET
9 - BRACKET
10 - SPRING
11 - PIN
12 - PIN
13 - LATCH
14 - SPRING
13
11
14
12
9
10
6
5
4
3
2
8
1
7
LEVER
.020 IN. MAXIMUM RADIAL CLEARANCE
CRADLE
CRADLE CLEARANCE ADJUSTMENT
WE 68592

NOTE: FOLLOW NUMERIC SEQUENCE FOR DISASSEMBLY. REVERSE SEQUENCE FOR ASSEMBLY.

ASSEMBLY NOTE:
ADJUST LEVER TO CLEAR CRADLE (SEE INSET).

Figure 5-15. Disassembly/assembly of cradle door hold-open group.

NOTE: FOLLOW NUMERIC SEQUENCE FOR REMOVAL
REVERSE SEQUENCE FOR INSTALLATION



ASSEMBLY NOTES:

1. (ITEM 18) APPLY SEALING COMPOUND TYPE I CLASS I SPEC MIL-S-11030 TO FRAME AREA WHERE WINDOWS INSTALL. MUST BE WATERTIGHT.
2. TO ATTACH ITEM 14, USE ADHESIVE, TYPE II SPEC MIL-A-5092. MUST WITHSTAND A 5 LB. PULL PER INCH OF WIDTH PERPENDICULAR TO SURFACE (C 8000-IL-A).
3. ASSEMBLY REQUIREMENTS OF SPRINGS (ITEM 10), SEE TABLE 13.

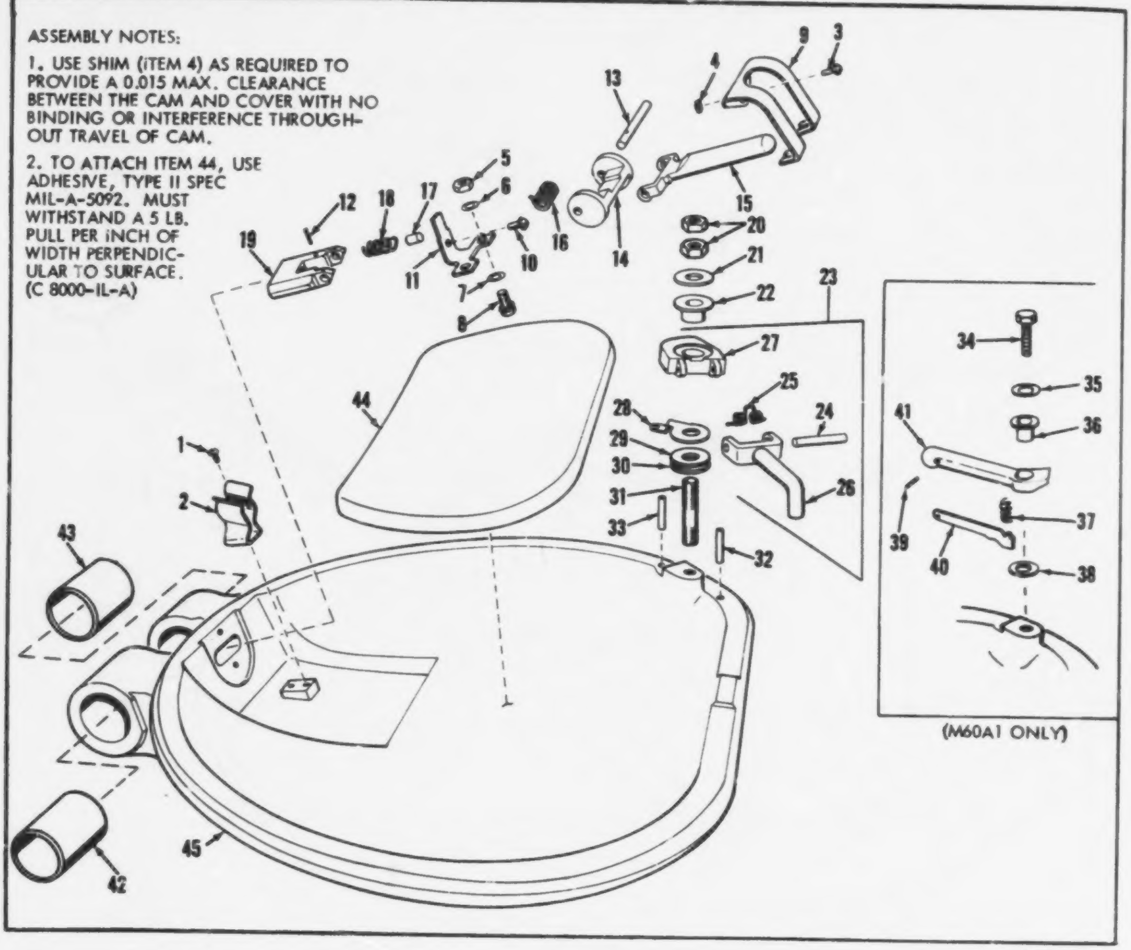
WE 67918

LEGEND to fig. 5-16:

1—Screw (2)
2—Washer (2)
3—Hinge assembly
4—Hinge assembly
5—Door
6—Wire
7—Screw (8)
8—Cover (2)
9—Cap
10—Spring (13)
11—Cap
12—Tube
13—Hatch assembly
14—Seal
15—Wire
16—Screw (16)
17—Wedge (8)
18—Window (8)

Figure 5-16. Removal / installation of hatch door group.

NOTE: FOLLOW NUMERIC SEQUENCE FOR DISASSEMBLY. REVERSE SEQUENCE FOR ASSEMBLY.



ASSEMBLY NOTES:

1. USE SHIM (ITEM 4) AS REQUIRED TO PROVIDE A 0.015 MAX. CLEARANCE BETWEEN THE CAM AND COVER WITH NO BINDING OR INTERFERENCE THROUGHOUT TRAVEL OF CAM.
2. TO ATTACH ITEM 44, USE ADHESIVE, TYPE II SPEC MIL-A-5092. MUST WITHSTAND A 5 LB. PULL PER INCH OF WIDTH PERPENDICULAR TO SURFACE. (C 8000-IL-A)

9
3
4
13
5
6
12
18
17
16
14
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11
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8
21
22
23
27
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41
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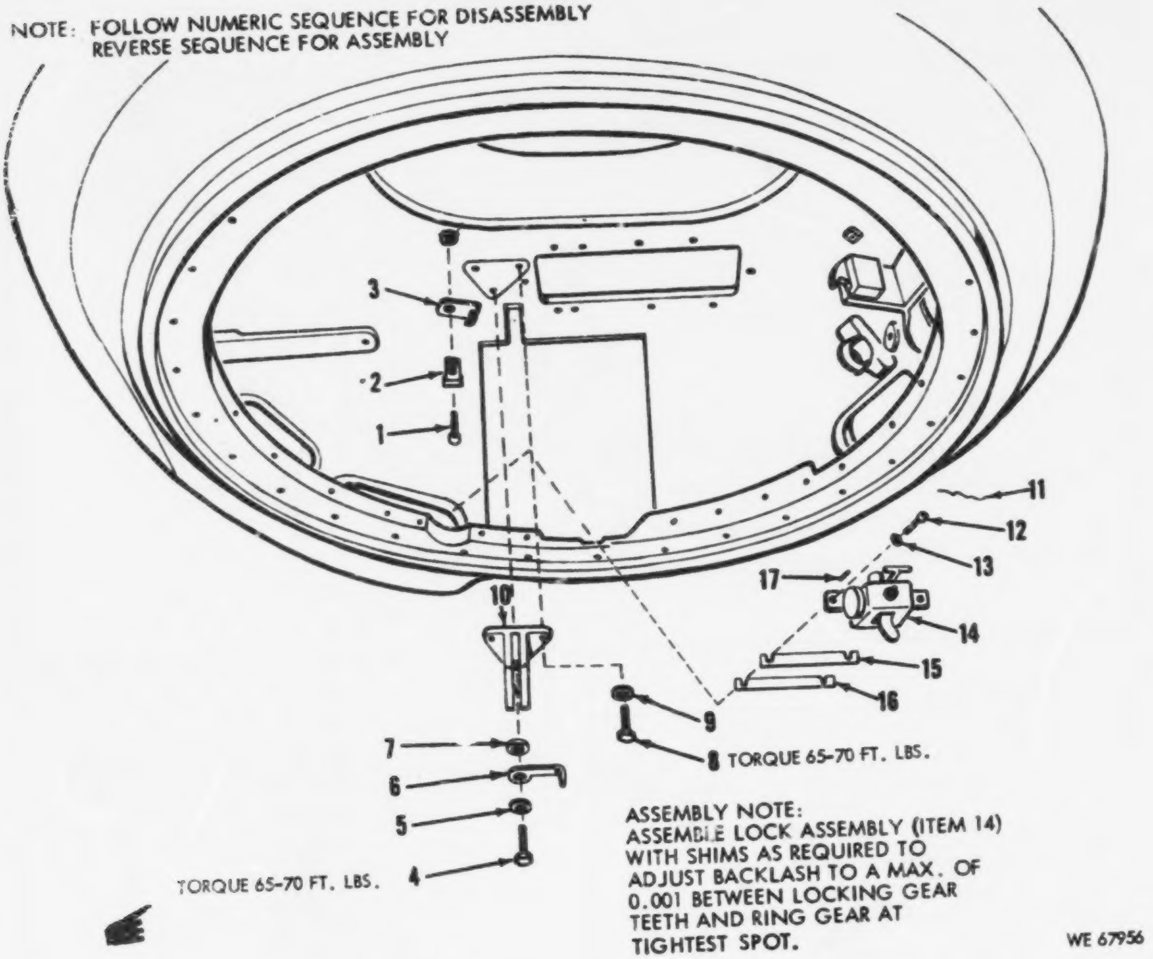
30
31
33
26
44
1
2
43
37
39
40
38
32
45
42
(M60A1 ONLY)

WE 67916

LEGEND to fig. 5-17:

1—SCREW (2)
2—Clip
3—Bolt
4—Shim
5—Nut (2)
6—Washer (2)
7—Washer (2)
8—Bolt (2)
9—Cover
10—Bolt
11—Support
12—Pin
13—Pin
14—Cam
15—Handle
16—Spring
17—Disk
18—Spring
19—Dog
20—Nut (M60)
21—Washer (M60)
22—Bushing (M60)
23—Lock assembly (M60)
24—Pin (M60)
25—Spring (M60)
26—Handle (M60)
27—Cam (M60)
28—Retainer (M60)
29—Shim (M60)
30—Shim (M60)
31—Stud (M60)
32—Pin (M60)
33—Pin (M60)
34—Bolt
35—Shim
36—Bushing
37—Spring
38—Shim
39—Pin
40—Plate
41—Handle
42—Bearing
43—Bearing
44—Pad
45—Cover

Figure 5-17. Disassembly / assembly of hatch door assembly.



NOTE: FOLLOW NUMERIC SEQUENCE FOR DISASSEMBLY
REVERSE SEQUENCE FOR ASSEMBLY

8 TORQUE 65-70 FT. LBS.

TORQUE 65-70 FT. LBS.

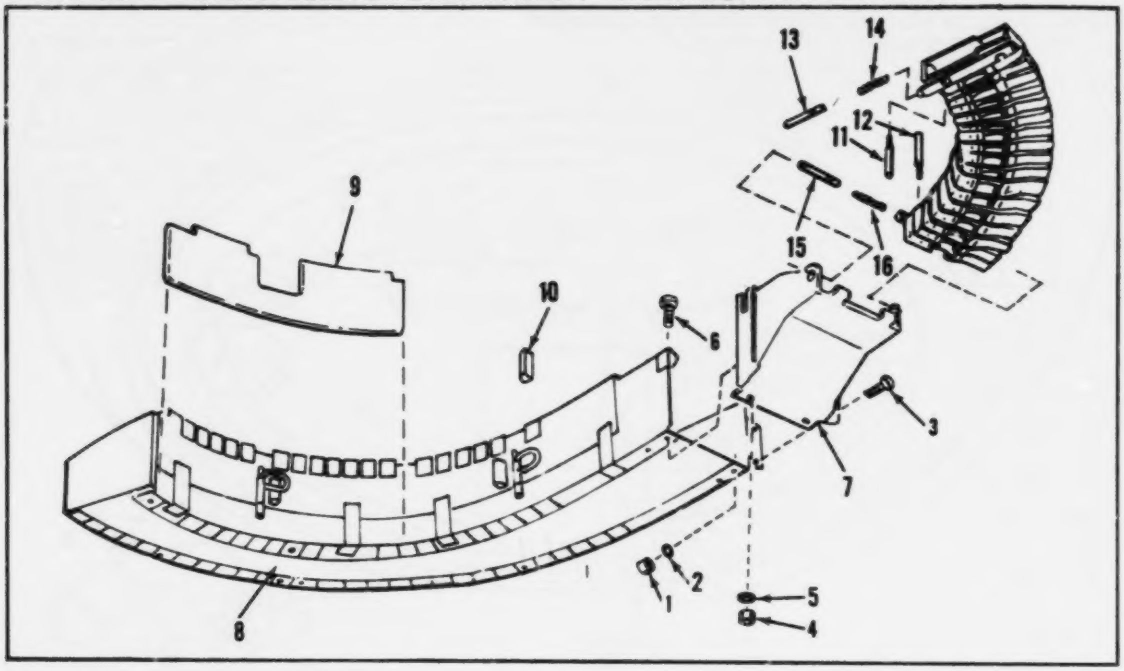
ASSEMBLY NOTE:
ASSEMBLE LOCK ASSEMBLY (ITEM 14) WITH SHIMS AS REQUIRED TO ADJUST BACKLASH TO A MAX. OF 0.001 BETWEEN LOCKING GEAR TEETH AND RING GEAR AT TIGHTEST SPOT.

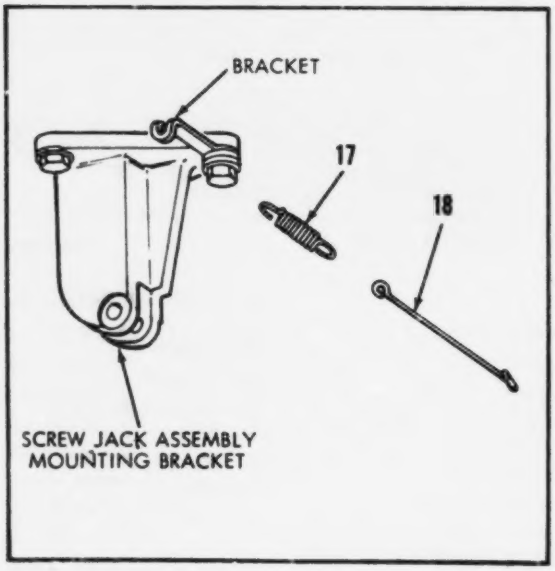
WE 67956

LEGEND to fig. 5-18:
1—Bolt
2—Clamp
3—Bracket
4—Screw
5—Washer
6—Bracket
7—Washer
8—Screw (2)
9—Washer (2)
10—Bracket
11—Wire
12—Screw (2)
13—Washer (2)
14—Lock assembly
15—Shim
16—Shim
17—Pin

Figure 5-18 Removal/installation of cupola interior parts.

NOTE: FOLLOW NUMERIC SEQUENCE FOR DISASSEMBLY. REVERSE SEQUENCE FOR ASSEMBLY.

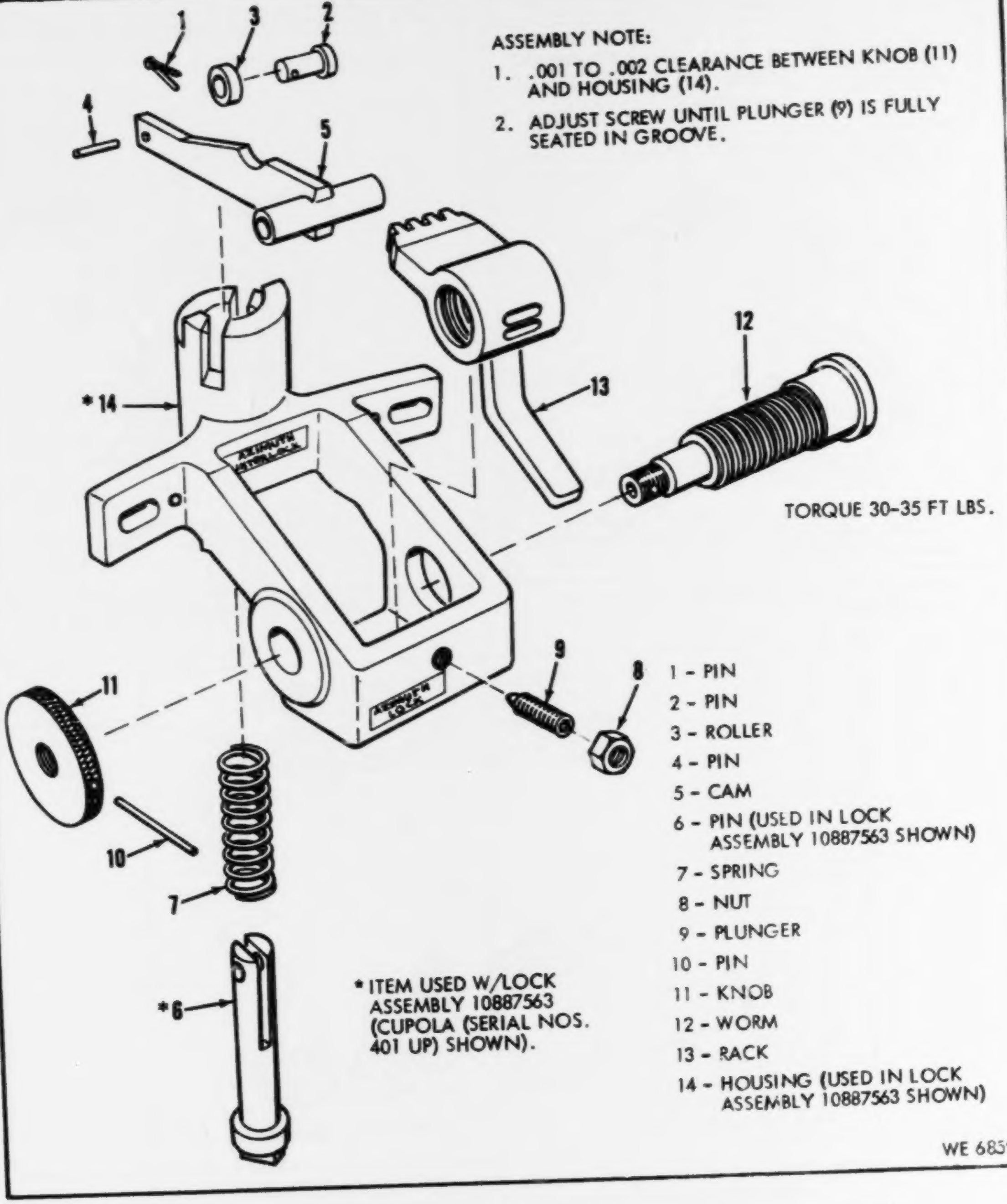

13
14
12
11
9
15
16
10
6
3
7
2
1
5
4
8


BRACKET
17
18
SCREW JACK ASSEMBLY
MOUNTING BRACKET

1 - NUT (2)
2 - WASHER (2)
3 - SCREW (2)
4 - NUT (2)
5 - WASHER (2)
6 - SCREW (2)
7 - TRACK
8 - BOX
9 - PAD ASSEMBLY
10 - PAD (3)
11 - PIN (2)
12 - PIN (2)
13 - PIN (2)
14 - SPRING
15 - PIN (2)
16 - SPRING
17 - SPRING
18 - HANGER

WE 67917

Figure 5-19. Disassembly / assembly of ammunition feed system and periscope stowage arm



ASSEMBLY NOTE:

1. .001 TO .002 CLEARANCE BETWEEN KNOB (11) AND HOUSING (14).
2. ADJUST SCREW UNTIL PLUNGER (9) IS FULLY SEATED IN GROOVE.

TORQUE 30-35 FT LBS.

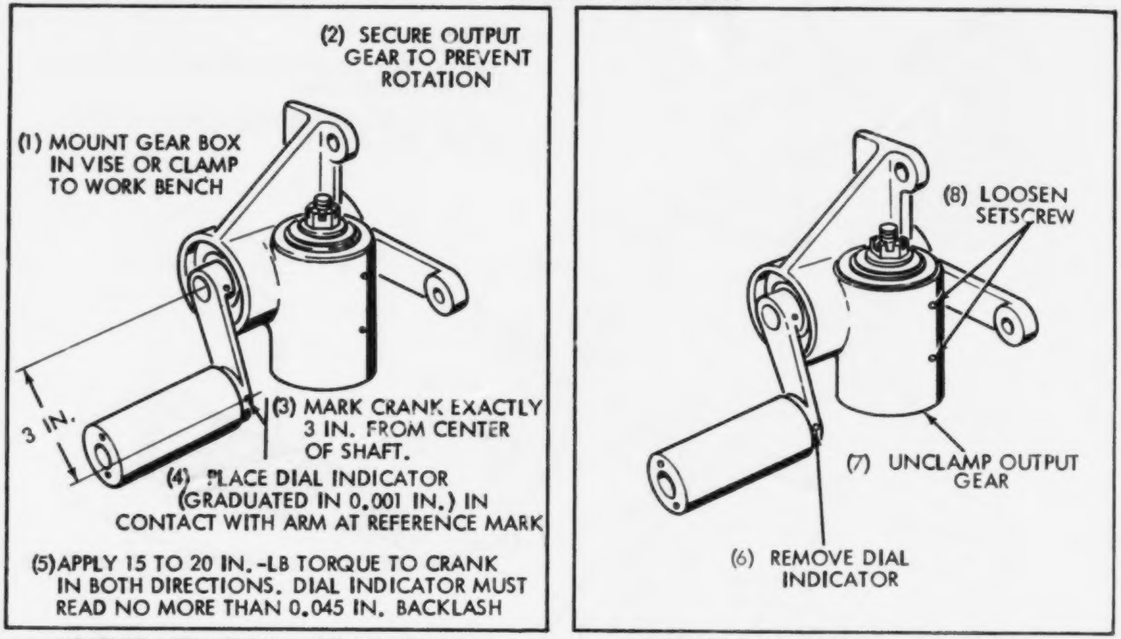
1 - PIN
2 - PIN
3 - ROLLER
4 - PIN
5 - CAM
6 - PIN (USED IN LOCK ASSEMBLY 10887563 SHOWN)
7 - SPRING
8 - NUT
9 - PLUNGER
10 - PIN
11 - KNOB
12 - WORM
13 - RACK
14 - HOUSING (USED IN LOCK ASSEMBLY 10887563 SHOWN)

* ITEM USED W/LOCK ASSEMBLY 10887563 (CUPOLA (SERIAL NOS. 401 UP) SHOWN).

WE 68593

Figure 5-20. Disassembly / assembly of azimuth lock assembly—10884265 or 10887563.

NOTE: FOLLOW NUMERIC SEQUENCE FOR ADJUSTMENT PROCEDURES.



(1) MOUNT GEAR BOX IN VISE OR CLAMP TO WORK BENCH

(2) SECURE OUTPUT GEAR TO PREVENT ROTATION

(3) MARK CRANK EXACTLY 3 IN. FROM CENTER OF SHAFT.

(4) PLACE DIAL INDICATOR (GRADUATED IN 0.001 IN.) IN CONTACT WITH ARM AT REFERENCE MARK

(5) APPLY 15 TO 20 IN.-LB TORQUE TO CRANK IN BOTH DIRECTIONS. DIAL INDICATOR MUST READ NO MORE THAN 0.045 IN. BACKLASH

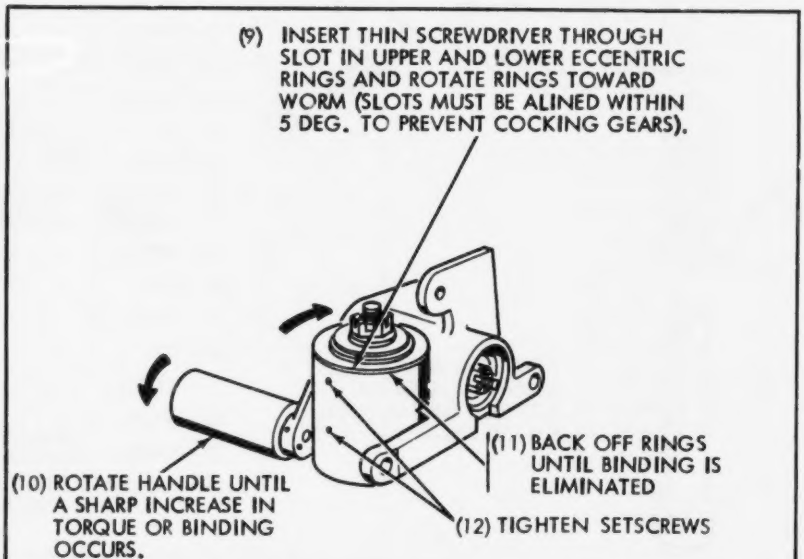
MEASURE ACTUATION BACKLASH OF GEAR BOX ASSEMBLY

(6) REMOVE DIAL INDICATOR

(7) UNCLAMP OUTPUT GEAR

(8) LOOSEN SETSCREW

PREPARE GEAR BOX FOR ADJUSTMENT



(9) INSERT THIN SCREWDRIVER THROUGH SLOT IN UPPER AND LOWER ECCENTRIC RINGS AND ROTATE RINGS TOWARD WORM (SLOTS MUST BE ALINED WITHIN 5 DEG. TO PREVENT COCKING GEARS).

(10) ROTATE HANDLE UNTIL A SHARP INCREASE IN TORQUE OR BINDING OCCURS.

(11) BACK OFF RINGS UNTIL BINDING IS ELIMINATED

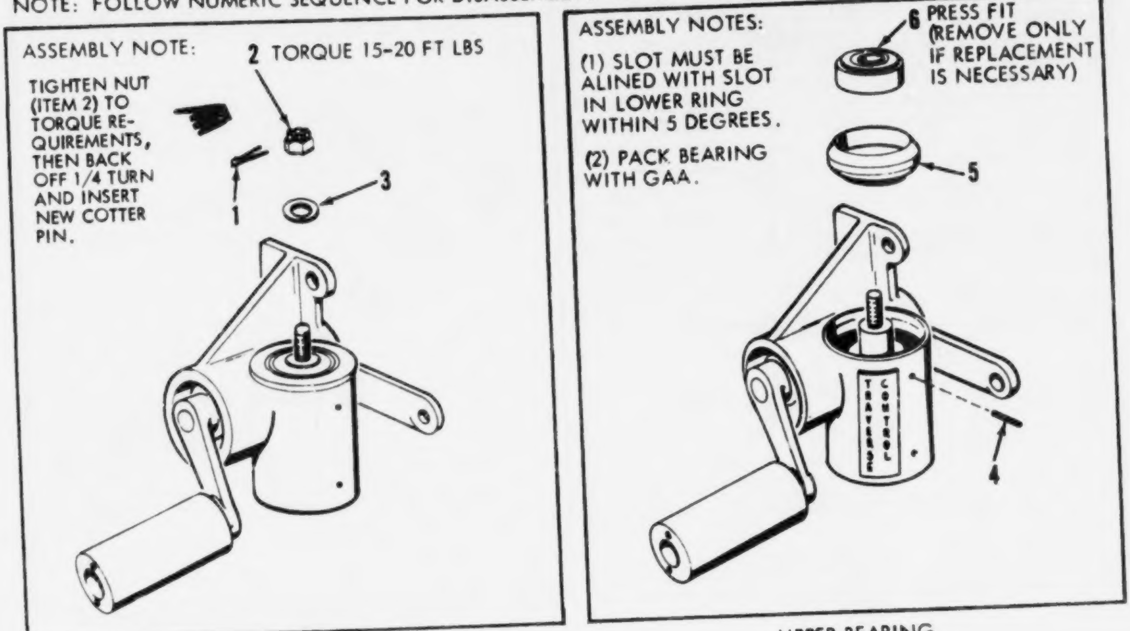
(12) TIGHTEN SETSCREWS

NOTE: RECHECK BACKLASH. IF STILL OUTSIDE TOLERANCE, REPEAT PROCEDURE UNTIL BACKLASH IS LESS THAN 0.045 IN.

WE 9982

Figure 5-21. Azimuth gear box assembly – actuation backlash adjustment.

NOTE: FOLLOW NUMERIC SEQUENCE FOR DISASSEMBLY. REVERSE SEQUENCE FOR ASSEMBLY.



ASSEMBLY NOTE:

2 TORQUE 15-20 FT LBS

TIGHTEN NUT (ITEM 2) TO TORQUE REQUIREMENTS, THEN BACK OFF 1/4 TURN AND INSERT NEW COTTER PIN.

ASSEMBLY NOTES:

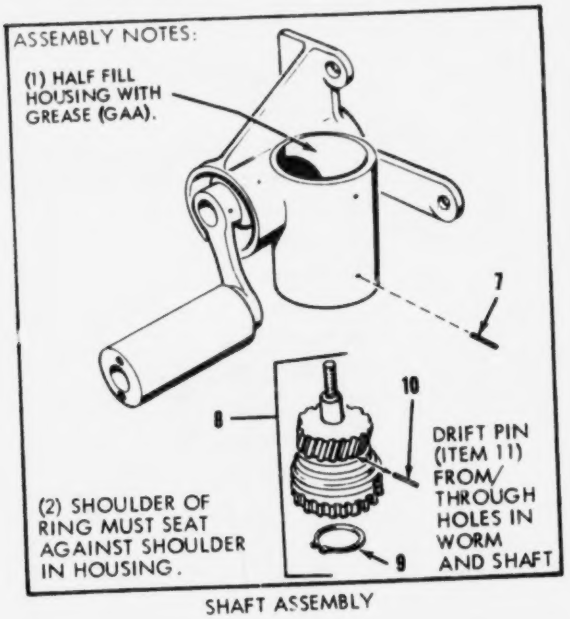
(1) SLOT MUST BE ALINED WITH SLOT IN LOWER RING WITHIN 5 DEGREES.

(2) PACK BEARING WITH GAA.

6 PRESS FIT (REMOVE ONLY IF REPLACEMENT IS NECESSARY)

UPPER BEARING RETAINING HARDWARE

UPPER BEARING



ASSEMBLY NOTES:

(1) HALF FILL HOUSING WITH GREASE (GAA).

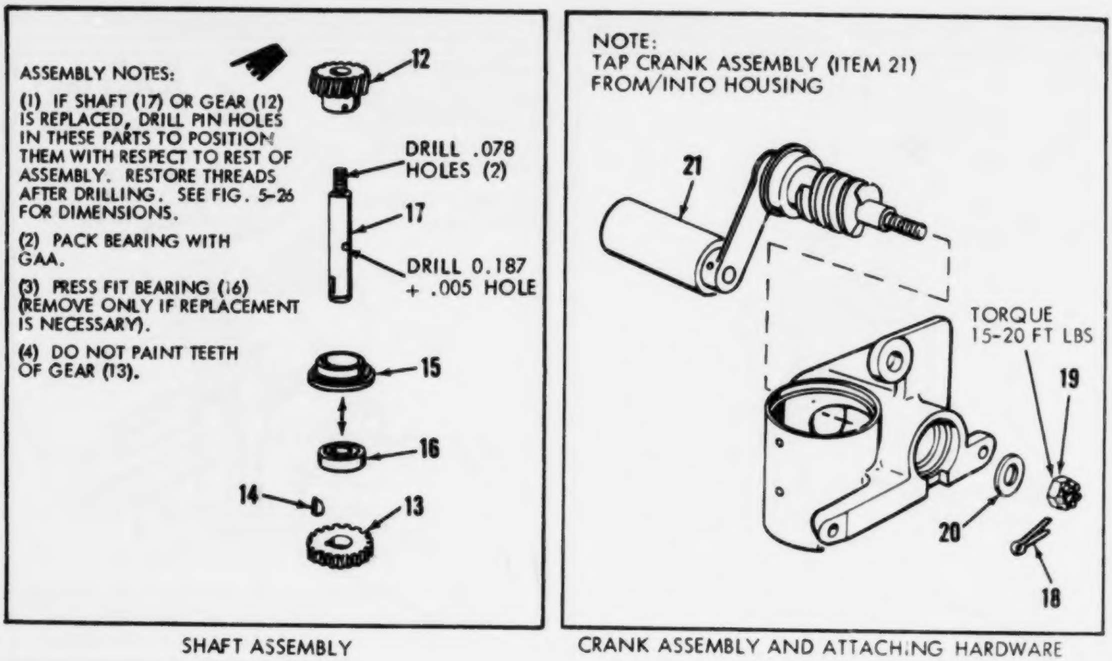
(2) SHOULDER OF RING MUST SEAT AGAINST SHOULDER IN HOUSING.

DRIFT PIN (ITEM 11) FROM/THROUGH HOLES IN WORM AND SHAFT

SHAFT ASSEMBLY

WE 67943

Figure 5-22. Disassembly / assembly of azimuth gear box (1 of 3).


ASSEMBLY NOTES:

(1) IF SHAFT (17) OR GEAR (12) IS REPLACED, DRILL PIN HOLES IN THESE PARTS TO POSITION THEM WITH RESPECT TO REST OF ASSEMBLY. RESTORE THREADS AFTER DRILLING. SEE FIG. 5-26 FOR DIMENSIONS.

(2) PACK BEARING WITH GAA.

(3) PRESS FIT BEARING (16) (REMOVE ONLY IF REPLACEMENT IS NECESSARY).

(4) DO NOT PAINT TEETH OF GEAR (13).

DRILL .078 HOLES (2)

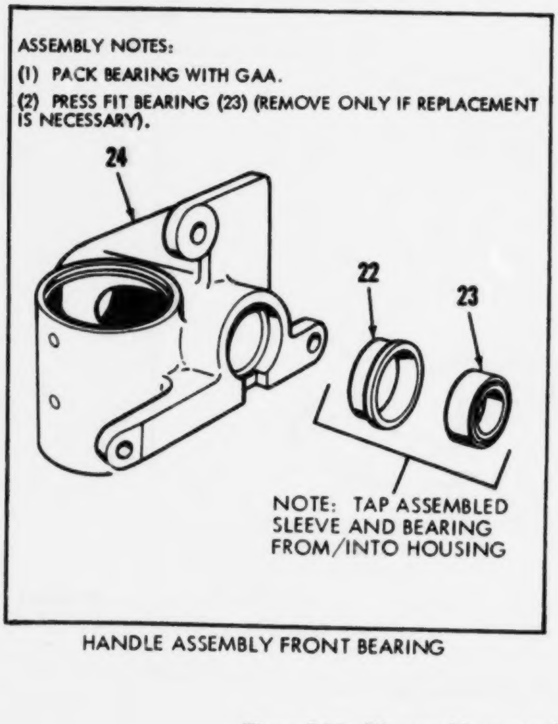
DRILL 0.187 + .005 HOLE

NOTE: TAP CRANK ASSEMBLY (ITEM 21) FROM/INTO HOUSING

TORQUE 15-20 FT LBS

SHAFT ASSEMBLY

CRANK ASSEMBLY AND ATTACHING HARDWARE


ASSEMBLY NOTES:

(1) PACK BEARING WITH GAA.

(2) PRESS FIT BEARING (23) (REMOVE ONLY IF REPLACEMENT IS NECESSARY).

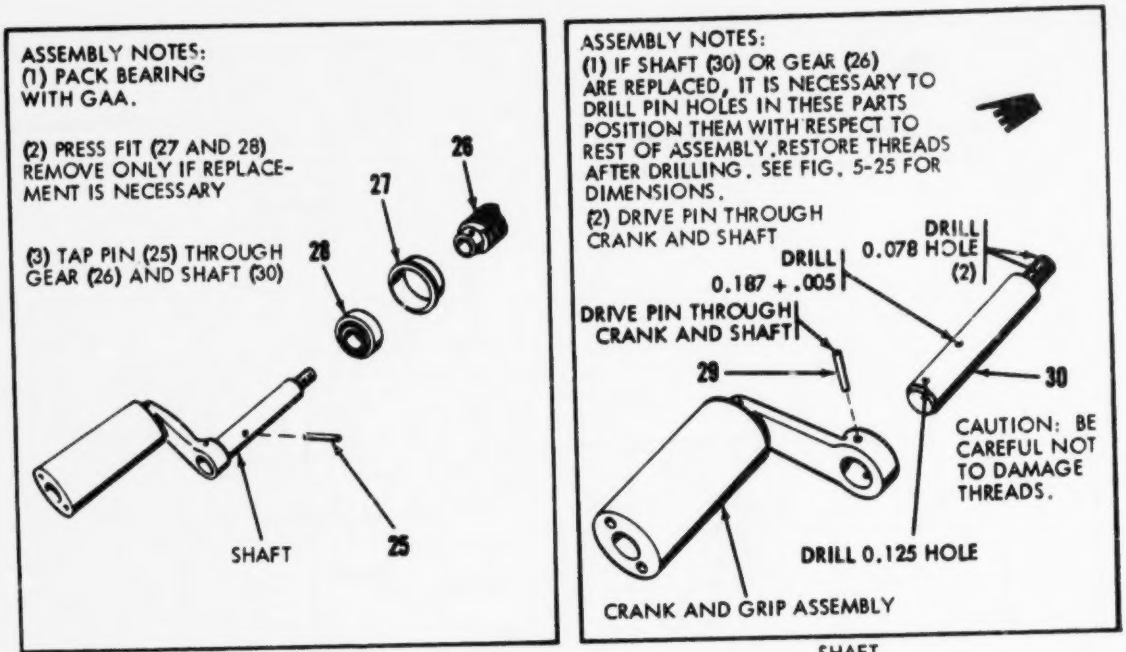
NOTE: TAP ASSEMBLED SLEEVE AND BEARING FROM/INTO HOUSING

HANDLE ASSEMBLY FRONT BEARING

12 - GEAR
13 - GEAR
14 - KEY
15 - RING
16 - BEARING
17 - SHAFT
18 - PIN
19 - NUT
20 - SPACER
21 - CRANK ASSEMBLY
22 - BUSHING
23 - BEARING
24 - HOUSING

WE 67944

Figure 5-23. Disassembly / assembly of azimuth gear box (2 of 3).



ASSEMBLY NOTES:
(1) PACK BEARING WITH GAA.
(2) PRESS FIT (27 AND 28) REMOVE ONLY IF REPLACEMENT IS NECESSARY
(3) TAP PIN (25) THROUGH GEAR (26) AND SHAFT (30)

26
27
28
SHAFT
25

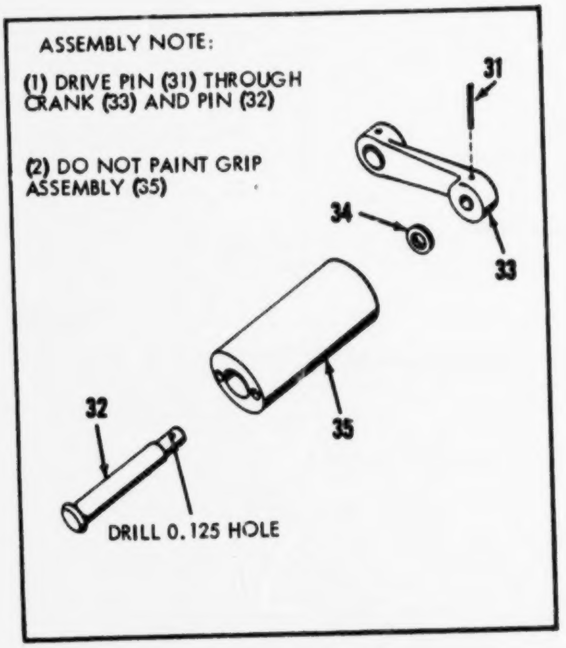
CRANK ASSEMBLY

ASSEMBLY NOTES:
(1) IF SHAFT (30) OR GEAR (26) ARE REPLACED, IT IS NECESSARY TO DRILL PIN HOLES IN THESE PARTS POSITION THEM WITH RESPECT TO REST OF ASSEMBLY. RESTORE THREADS AFTER DRILLING. SEE FIG. 5-25 FOR DIMENSIONS.
(2) DRIVE PIN THROUGH CRANK AND SHAFT

CAUTION: BE CAREFUL NOT TO DAMAGE THREADS.

DRILL 0.078 HOLE (2)
DRILL 0.187 + .005
DRIVE PIN THROUGH CRANK AND SHAFT
29
30
DRILL 0.125 HOLE
CRANK AND GRIP ASSEMBLY

SHAFT



ASSEMBLY NOTE:
(1) DRIVE PIN (31) THROUGH CRANK (33) AND PIN (32)
(2) DO NOT PAINT GRIP ASSEMBLY (35)

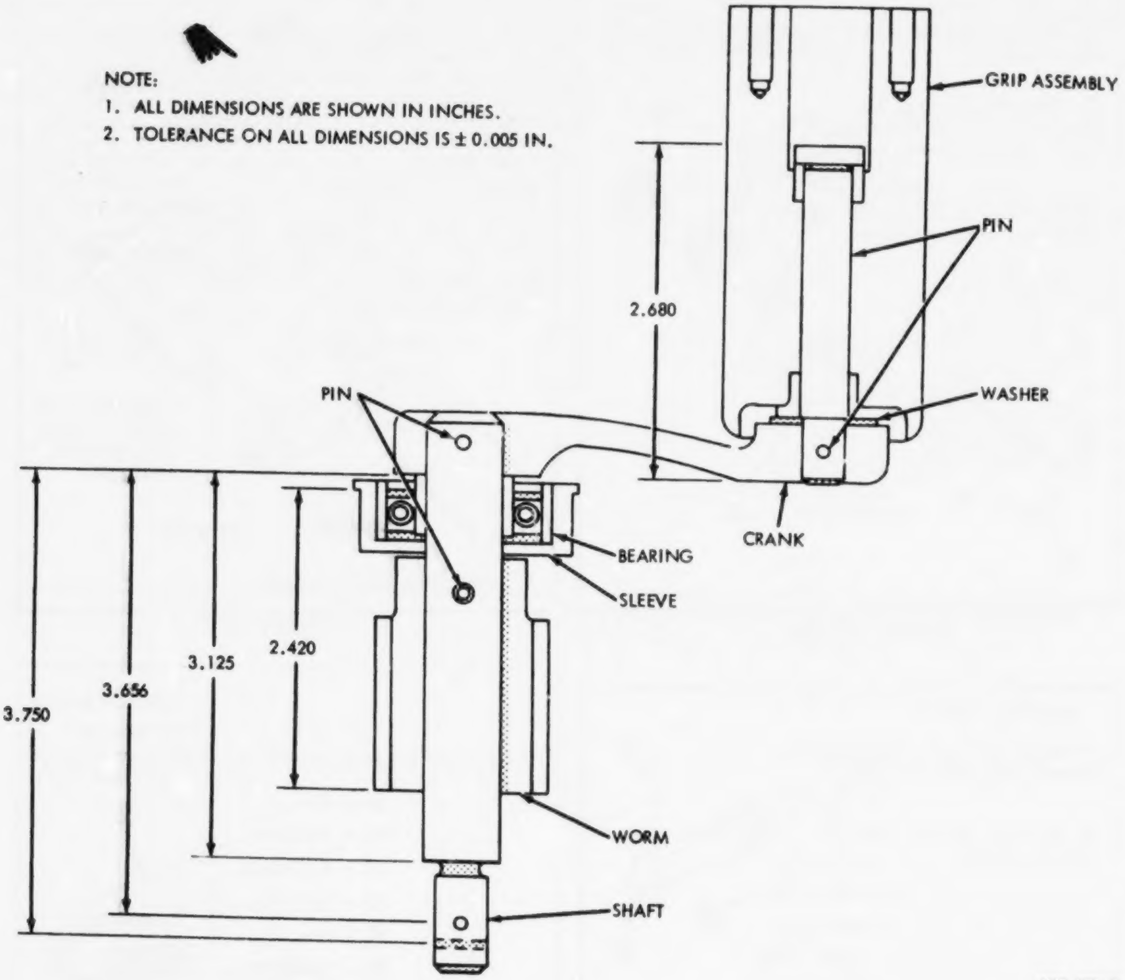
31
34
33
32
35
DRILL 0.125 HOLE

GRIP ASSEMBLY AND CRANK

25 - PIN
26 - GEAR
27 - BUSHING
28 - BEARING
29 - PIN
30 - SHAFT
31 - PIN
32 - PIN
33 - CRANK
34 - WASHER
35 - GRIP ASSEMBLY

WE 67957

Figure 5-24. Disassembly / assembly of azimuth gear box (3 of 3).



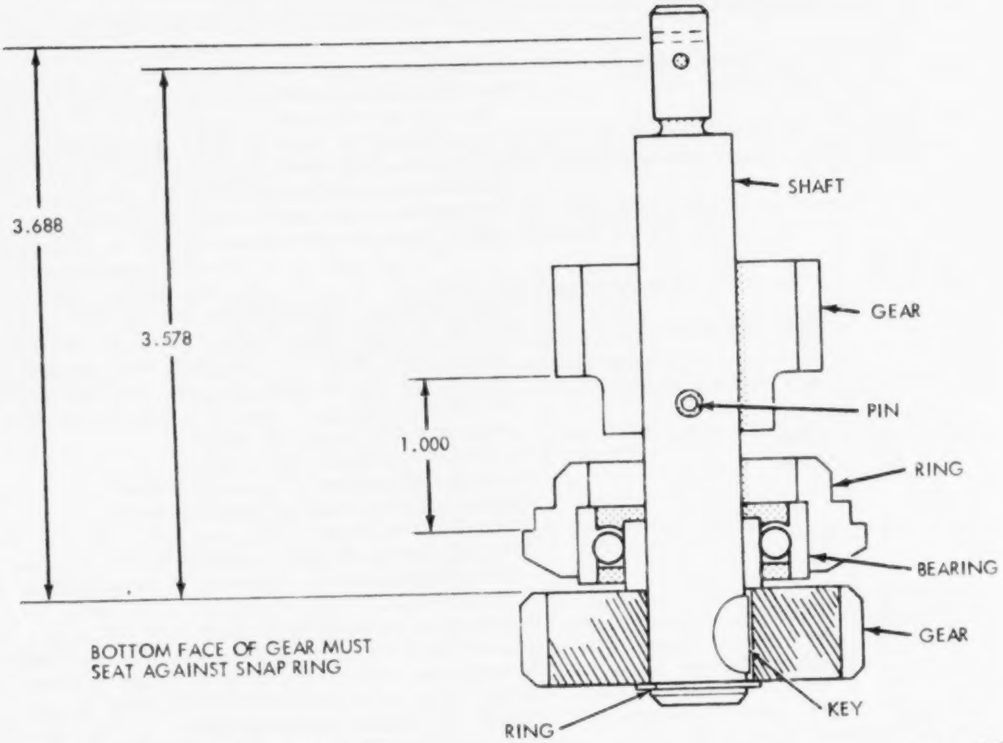
NOTE:

1. ALL DIMENSIONS ARE SHOWN IN INCHES.
2. TOLERANCE ON ALL DIMENSIONS IS ± 0.005 IN.

GRIP ASSEMBLY
PIN
2.680
PIN
WASHER
CRANK
BEARING
SLEEVE
2.420
3.125
3.656
3.750
WORM
SHAFT

WE 67919

Figure 5-25. Azimuth gear box crank assembly—sectional view.


3.688
3.578
1.000
SHAFT
GEAR
PIN
RING
BEARING
GEAR
KEY
RING
BOTTOM FACE OF GEAR MUST SEAT AGAINST SNAP RING

WE 16181[illegible]

NOTE: 1. ALL DIMENSIONS SHOWN ARE IN INCHES.
2. TOLERANCES ON DIMENSIONS ARE ± 0.005 INCHES.

Figure 5-26. Azimuth gear shaft assembly sectional view.

Table 13. Inspection of Cupola Components and Assemblies

Figure	Item	Component	Inspection point
2-16	84	Azimuth gear box (installed).	Backlash at 3 in. crank arm—0.045 min to 0.055 max. Handle torque required to start rotation from any point—25 in.-lb.
2-16	82	Spring	No deformities that will impair proper functioning: not cracked or broken.
5-13	9		
5-17	16		
5-17	18		
5-17	25		
5-20	7		
5-4	5	Bearing ball	Diameter 0.4033 to 0.4073 inch.
5-4	7	Spur gear	No cracked, pitted, or distorted machined surfaces. Measurement over 0.406 ball placed in race and top surface of gear 0.634 to 0.638 inch. (Repeat at various positions around gear).
5-16	10	Leaf spring	Counterbalance door 7° to 20° from horizontal center line of hinge. (nominal opening—15°).
5-9	11	Screwjack assembly	(Not installed) backlash at 2.5 in. radius from center of input shaft between 0.002 min. and 0.009 max. (With machine gun, flexible feed chute, canvas cover, and periscope linkage installed) handle breakaway torque shall be approximately equal when cranking handle clockwise or counterclockwise. There should be no excessive cranking effort or binding.
5-10	16	Gear	No cracked, pitted, or distorted machine surfaces. Runout of threads outside diameter 0.002 max to 0.004 max.
5-16	13	Hatch assembly	With hatch closed, force required to lock or unlock hatch shall not exceed 20 lb. With hatch unlocked, force required to push hatch to extreme open position shall not exceed 55 lb. Force required to unlock hatch from open latch position and close hatch shall not exceed 35 lb at end of handle.
5-20	3	Roller	Inside diameter 0.247 to 0.254 inches.
5-20	12	Worm	Small diameter of shaft 0.622 to 0.625 inches. Large diameter of shaft 1.122 to 1.125 inches. Shaft diameter—measurement over 0.110 diameter wires 1.061.
5-20	13	Rack	Teeth not broken or worn to extent of impairing proper functioning. Plunger grooves not worn to extent of impairing proper functioning.
5-20	9	Plunger	Spring functions properly.
5-23	12	Gear	Measurement over two 0.15625 balls, 1.793 to 1.7985 inches.
5-23	13	Spur gear	Measurement over two 0.1728 pins, 3.3200 to 3.3333 inches.
5-24	26	Gear	Measurement over two 0.15625 balls, 1.445 to 1.4511 inches.
5-24	32	Pin	Outside diameter 0.371 to 0.375 inches.

APPENDIX A

REFERENCES

NOTE

Additional references are listed in TM 9-2350-215-10 and TM 9-2350-215-20.

A-1. Publication Indexes

The following indexes should be referred to frequently for the latest changes or revisions of references given in this appendix and for new publications relating to materiel covered in this technical manual.

DA Pam 108-1	Index of Army Films, Transparencies, GTA Charts, and Recordings
DA Pam 310-1	Index of Administrative Publications
DA Pam 310-2	Index of Blank Forms
DA Pam 310-3	Index of Doctrinal Training, and Organizational Publications
DA Pam 310-4	Index of Technical Manuals, Technical Bulletins, Supply Manuals (types 7, 8, and 9), Supply Bulletins, and Lubrication Orders
DA Pam 310-6	Index of Supply Catalogs and Supply Manuals (Excluding types 7, 8, and 9)
DA Pam 310-7	U. S. Army Equipment Index of Modification Work Orders

A-2. Manuals

LO 9-2350-215-12	Lubrication Order for Tank, Combat, Full-Tracked: 105-MM Gun, M60A1 and Tank, Combat, Full-Tracked: 105-MM Gun, M60
TB 9-300-1/1	Combat Vehicles: Inspection, Care, and Preservation During Storage
TB 9-1000-234-35	Exercising of Recoil Mechanisms and Equilibrators
TB 9-2300-281-35	Standards for Oversea Shipment or Domestic Issue of Combat, Tactical, and Special Purpose Vehicles
TB 746-93-1	Color and Marking of Military Vehicles, Construction Equipment, and Materials Handling Equipment
TM 9-208-1	Cleaning of Ordnance Materiel
TM 9-213	Painting Instructions for Field Use
TM 9-214	Inspection, Care, and Maintenance of Anti-friction Bearings
TM 9-237	Welding Theory and Application
TM 9-1000-202-35	Evaluation of Cannon Tubes
TM 9-1240-272-35	Field and Depot Maintenance Manual: Mount, Periscope: M119 (1240-796-9687)
TM 9-2350-215-ESC	Equipment Serviceability Criteria for Tank, Combat, Full-Tracked: M60 and M60A1
TM 9-2350-215-10	Operator's Manual: Tank, Combat, Full-Tracked: 105-MM Gun, M60A1 w/e (2350-756-8497); Tank, Combat, Full-Tracked: 105-MM Gun, M60 w/e (2350-678-5773)
TM 9-2350-215-20	Organizational Maintenance Manual: Tank, Combat, Full-Tracked: 105-MM Gun, M60A1 w/e (2350-756-8497); Tank, Combat, Full-Tracked: 105-MM Gun, M60 w/e (2350-678-5773)
TM 9-4933-200-35	DS, GS, and Depot Maintenance Manual: Pullover Gages and Borescopes M1 and M2
TM 9-6175	Field and Depot Maintenance Manual: Periscope Mount M104, M104A1, and M104A2
TM 38-250-1	Preservation, Packaging, and Packing of Military Supplies and Equipment: Preservation and Packaging (Volume 1)
TM 38-750	The Army Maintenance Management System (TAMMS)
TM 740-90-1	Administrative Storage of Equipment
TM 743-200-1	Storage and Materials Handling
TM 750-138	Procedures for Rapid Deployment, Redeployment, and Retrograde: Combat Vehicles

A-3. Supply Publications

C 6800-IL	Chemical and Chemical Products (Gases, Compressed and Liquefied)
SB 9-115	Storage and Issue of Spare Cannon and Cannon Tubes with Partially Expended Service Life
SB 9-140	Field Maintenance Floats: Major Items of Equipment Authorized for Stockage in both Peacetime and Wartime

SB 9-156	Publications for Packaging Army General Supplies
SB 38-8-1	Storage of Army Supplies and Equipment—Covered and Open Storage
SC 4933-95-CL-A12	Shop Set, Artillery: Field Maintenance Set N (FSN 4933-754-0704) (Line Item T24523 formerly Line Item 440502) and Shop Set, Artillery: Field Maintenance, Set N, MAP only (FSN 4933-919-0102)
SC 4933-95-CL-E09	Accessory Outfit for Pullover Gages: Basic (4933-348-8652) and Supplemental Pullover Gages
SC 4933-95-CL-E19	Tool Kit, FA Repairman: Artillery and Combat Vehicle Armament (Basic) (FSN 4933-332-4204) and Tool Kit, FA Repairman: Artillery and Combat Vehicle Armament (Contact and Emergency Repair) (FSN 4933-332-4203)
SC 4940-95-CL-A17	Tool Kit, Paint: Field Maintenance, Post, Camp, and Station, Set D (FSN 4940-348-7695) (Line Item W47389 formerly Line Item 440663) and Tool Kit, Paint: Field Maintenance, Post, Camp, and Station, Set D, MAP only (FSN 4940-919-0110)
SC 5180-95-CL-A12	Tool Kit, Artillery Mechanics: (FSN 5180-357-7727) (Line Item W32182 formerly Line Item 453660)
SC 5180-95-CL-A51	Tool Kit, Turret Mechanic's: (FSN 5180-695-0139) (Line Item W57801 formerly Line Item 454008)
SC 6650-95-CL-E01	Borescope: Cannon Bore Inspecting, DS and GS Maintenance, M1 (20-mm — 40-mm) w / e (6650-318-4426) M2 (57-mm — 8-inch) w / e (6650-587-0986)
TM 9-1000-213-35P	DS, GS, and Depot Maintenance Repair Parts and Special Tools List for Cannon, 105-MM Gun, M68, Mount, Combination Gun, M116 and M140 and Cupola, Tank Commander's Caliber .50 Machine Gun, M19 used on Tank, Combat, Full-Tracked: 105-MM Gun, M60A1 w / e (2350-756-8497) and Tank, Combat, Full-Tracked: 105-MM Gun, M60 w / e (2350-678-5773)
TM 9-2300-378-20P / 2-1 and TM 9-2300-378-20P / 2-2	Turret — Tank, Combat, Full-Tracked: 152-mm Gun Launcher, M60A1E2 w / e (2350-930-3590); Tank, Combat, Full-Tracked: 105-mm Gun, M60A1 w / e (2350-756-8497); Tank, Combat, Full-Tracked: 105-mm Gun, M60 w / e (2350-778-5773); Vehicle, Combat Engineer Full-Tracked: M728 w / e (2350-795-1797); Tank, Combat, Full-Tracked: 90-mm Gun, M48A3 w / e (2350-895-9154)
TM 9-4933-200-35P	DS, GS, and Depot Maintenance Repair Parts and Special Tools List: Gages, Pullover, With Containers, 37-MM through 8-Inch and Accessory Outfit for Pullover Gages, Basic
TM 9-6650-231-35P	DS, GS, and Depot Maintenance Repair Parts and Special Tools List: Borescope: M1 (20-MM — 40-MM) 6650-318-4426 and Borescope: M2 (57-MM — 8-Inch) 6650-587-0986

A-4. Regulations

AR 385-41	U. S. Army Accident Codebook
AR 700-58	Report of Packaging and Handling Deficiencies
AR 700-1300-8	Malfunctions Involving Ammunition and Explosives
AR 750-8	Command Maintenance Management Inspections

A-5. Specifications and Standards

MIL-A-5092	Adhesive, Rubber Base, General Purpose
MIL-H-6083	Hydraulic Fluid, Petroleum Base, For Preservation and Testing (OHT)
MIL-C-10578	Corrosion Removing and Metal Conditioning Compound (Phosphoric Acid Base)
MIL-G-10924	Grease, Automotive and Artillery (GAA)
MIL-S-11030	Sealing Compound, Noncuring, Polysulfide Base
MIL-S-12158	Sealing Compound, Noncuring, Polybutene
MIL-B-12841	Basic Issue Items for Military Vehicles, Carriages, and Equipment, Preparation for Shipment and Storage of
MIL-W-13518	Wood Preservative, Tetrachlorophenol and Pentachlorophenol, Surface Sealing Compound
MIL-W-45206	Welding, Aluminum Alloy Armor
VV-G-671	Grease, Graphite (GG)
USASI-Y14.5-1966	Dimensioning and Tolerancing
MIL-STD-129	Marking for Shipment and Storage
MIL-STD-171	Finishing of Metal and Wood Surfaces
MIL-STD-413	Visual Inspection Guide for Rubber O-Rings

APPENDIX B

REPAIR PARTS AND SPECIAL TOOLS LIST

(SUPERSEDED by TM 9-1000-213-35P, 2 July 1970)

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- Azimuth lock assembly (*See* Cupola M19)
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